Mining CONGRESS JOURNAL

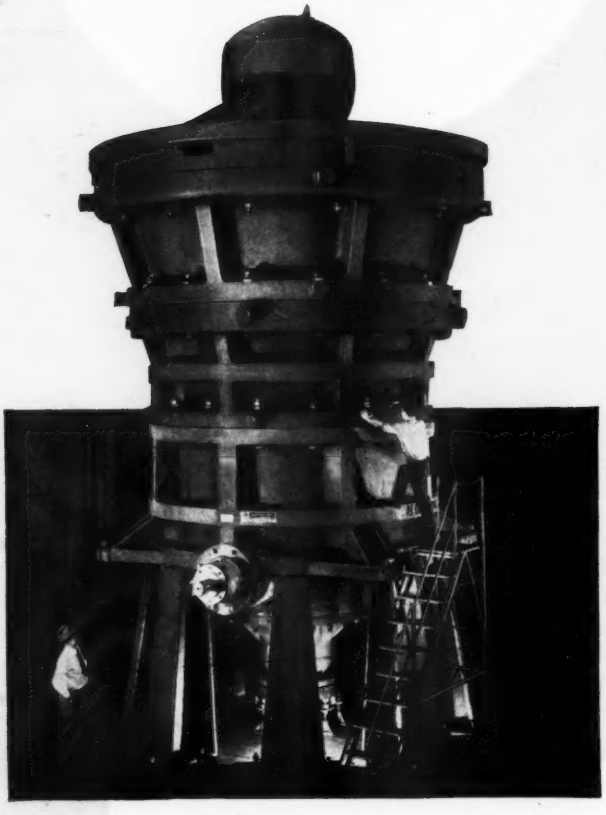
AMERICAN MINING CONGRESS

APRIL
1954

incinnati, Ohio — **AMC COAL CONVENTION** — *May 3-5*

SUPERIOR
Gyratory
CRUSHERS

29 in 3 YEARS!



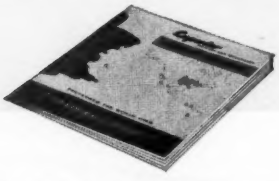
SUPERIOR primary and secondary gyratory crushers have been making a big name for themselves since they were introduced three years ago. Twenty-six are installed and operating... three are under construction now, including a huge 60 x 109 machine — largest crusher the world has ever known.

A policy of simplifying design and controlling quality has made Allis-Chalmers the leading builder of crushers. A continuing policy of *improving* crusher design has greatly extended this leadership.

This vast backlog of crusher application experience — over 75 years of it — is always available to you when you want to make sure of a successful installation. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4319

Superior is an Allis-Chalmers trademark.



NEW 32-Page Book Contains Helpful Crushing Data

Packed with factual "how to" information on figuring hp requirements, impact and compressive strengths.

Step-by-step procedures for estimating gyratory crusher sizes, capacities. Examples are worked out.

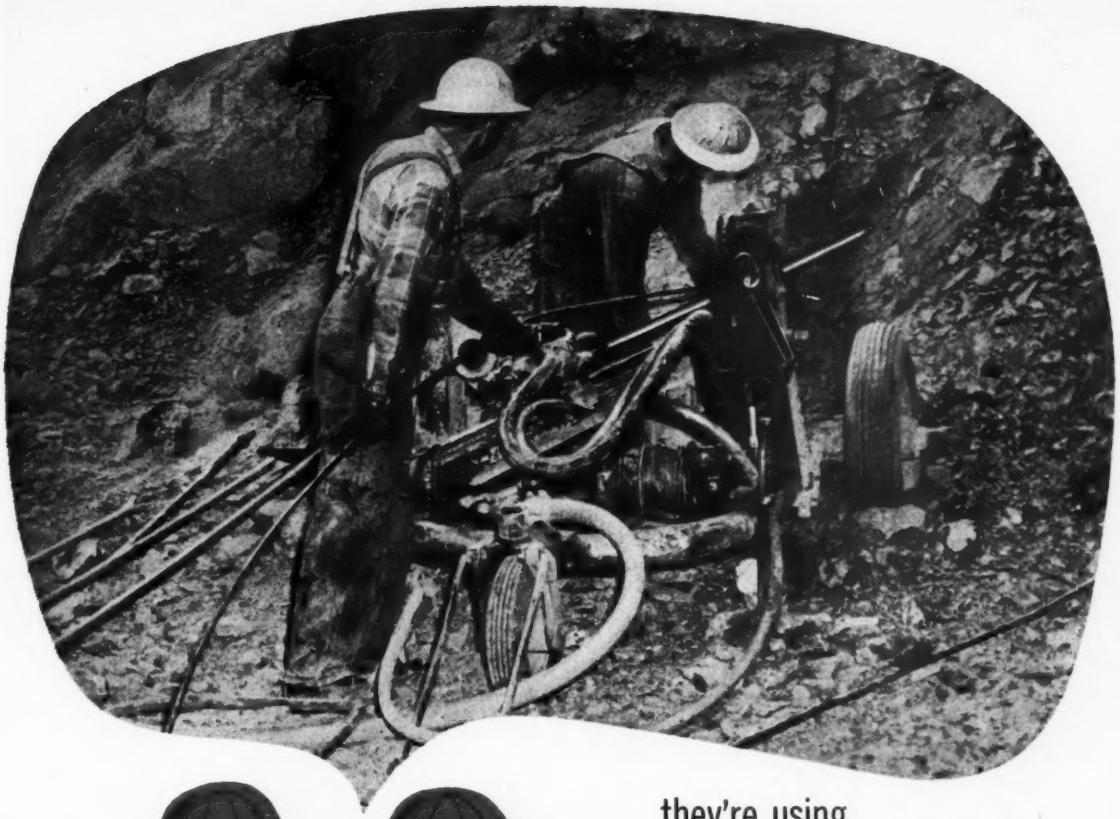
Many other valuable facts on gyratory crusher operation . . . application . . . engineering.

It's a book you'll want to have and keep!

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

A-C ALLIS-CHALMERS



they're using CRUCIBLE HOLLOW DRILL RODS on the New York State Throughway

This new high-speed superhighway will, when completed, speed streams of traffic across New York State from New York City to Buffalo.

It's a big, difficult construction job on which thousands of tons of rock must be moved. That's why you will find Crucible Hollow Drill Rods in use all along the route. Experienced construction men know they can rely upon the performance of these rods under the toughest field conditions.

There is a good reason for the dependability of Crucible Hollow Drill Rods . . . they are made to *tool steel* standards, by the leading producer of tool and special purpose steels. And this *extra* quality means fewer broken rods and lost bits. *For lowest cost per foot of hole drilled* — specify Crucible Hollow Drill Rods.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED · TOOL · REZISTAL STAINLESS · MAX-EL · ALLOY · SPECIAL PURPOSE STEELS

It costs time and money to be ONE DIPPER LATE!

Amsco manganese steel dippers are regularly ordered for replacement on equipment in the field. Often they go to users who found that ordinary steel dippers simply would not hold up.

It's smart economy to specify tough, dependable Amsco dippers with original equipment.

Next time you order a power shovel or a replacement dipper, specify long life right on your purchase order . . . specify an Amsco manganese steel dipper.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

when Overburden
squeezes the profits out of stripping . . .

CARDOX
Surface
AUGER MINER

CARDOX Surface AugerMiner teams up with mechanized loading for fast, lower-cost coal production.

Restores Abandoned Workings to Profitable Production

When excessive overburden puts a stop to conventional stripping, CARDOX Surface AugerMiners put mines back into profitable production. Drilling 100 to 120 feet, they salvage volume tonnage at a cost usually far less than for the original working. This "bonus" tonnage is *easy to get.*

CARDOX Surface AugerMiners are simply trucked or towed on their detachable wheels to the exposed surface. They are self positioning to the height of the seam. A rugged, 145 H.P. engine drives augers that drill holes up to 38 inches in diameter. AugerMiner coal is *clean* and *free of rock or shale* — because directional control keeps the auger boring into the best part of the seam. Coal can be loaded mechanically into trucks without further processing. A built-in retriever makes it easy to add or remove the 6-foot auger sections.

If you have a seam where overburden has squeezed the profits out of conventional stripping, you may have abandoned your best paying tonnage! Investigate the CARDOX Surface AugerMiner. See your CARDOX Representative — or write for AugerMiner Bulletin.

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

WAREHOUSES

Harper, West Virginia
Phone: Beckley 4812

Benton, Illinois
Phone: Benton 8-3821

St. Clairesville, Ohio
Phone: St. Clairesville 619

Library, Pennsylvania
Box 427
Phone: Library Colonial 3-6910

Camden-on-Gauley, W. Va.
Phone: Camden-on-Gauley 2181

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Phone: Evansville 2-8944

Pikeville, Kentucky
Route 2, Box 99
Phone: Robinson Creek 5

Louisville, Colorado
Phone: Louisville 234

Ottumwa, Iowa
Phone: Ottumwa 1900

APRIL, 1954

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CONTENTS

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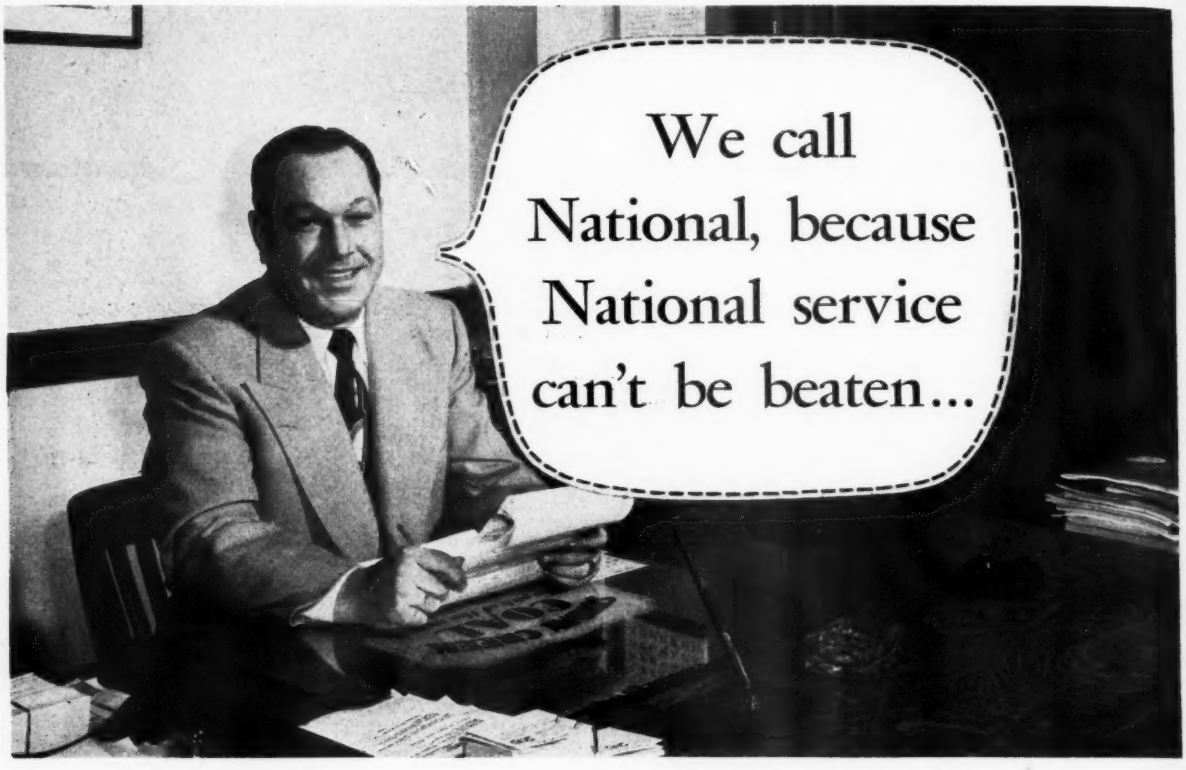
Indexed regularly by Engineering Index, Inc.

THE AMERICAN MINING CONGRESS
RING BLDG., WASHINGTON 6, D. C.

what happens when electrical failure ties up production at The Sunday Creek Coal Company? **Purchasing Agent E. H. Robinson says:**



"... I've been doing business with National for 25 years, and I've never found an organization more interested in giving its customers the best possible service."

Fast, reliable service has been a National byword since the company was organized in Bluefield, West Virginia, in 1917. Today, in addition to the main plant in Columbus, National operates plants in Bluefield, and in Harlan, Kentucky. These two are located and equipped especially for service to National's coal field customers.

"We do all of our own electrical repairs, but we've been able to reduce our coil inventory from $20,000 to almost nothing because we know we can rely on National for fast delivery of the windings we need."

And if you don't do your own motor repair and maintenance, you'll find that the speed with which National services and returns your equipment will cut your costs by letting you reduce your inventory of stand-by motors.

It will pay you to get better acquainted with your nearby National field engineer. If you don't know him, drop a line to the nearest National plant and ask for his name.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

THREE MARION 93-M SHOVELS

Harvest "Rock Cotton" in Canada

Three MARION 93-M Diesel shovels working in asbestos pits of the Canadian Johns-Manville Company, Ltd., in northern Ontario get a real workout.

They are on around-the-clock schedules in land where the mercury can drop to 60 below. The digging is all solid rock.

Two of these diesel shovels load out waste rock on both sides of the fiber-laden serpentine rock which the third machine digs. Despite the rigors of weather and terrain, each MARION turns in impressive tonnage records.

The details about 93-M strength, power and stamina to handle big assignments may point the way to a happy solution of some excavating problem for you. Why not ask your nearest MARION representative today about 93-M Diesel and Ward-Leonard electric machines?

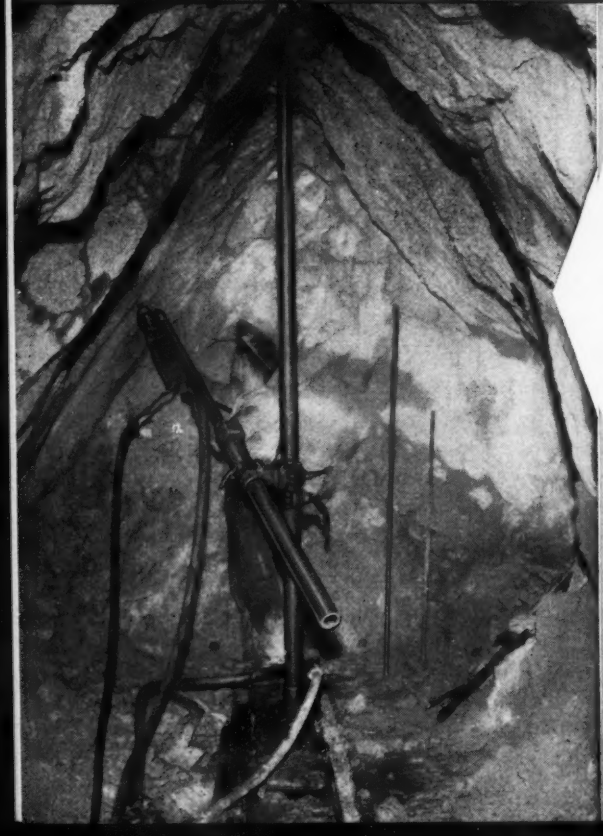
MARION **POWER SHOVEL CO.**
MARION, OHIO, U. S. A.

from 3/4 cu. yd. to 45 cu. yds.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

New! Speeds up

Jumbo shown is equipped with a Le Roi-CLEVELAND DR 24 air feed. It is available also with the HC23RW reverse air feed described below.



Miners like Le Roi-CLEVELAND HC23RW Reverse Air Feed Drifters

Management does, too

Faster Steel Changes! No swing or dump nuts to loosen and reset. Your miners simply swing drifter on feed cylinder and change steels. It's not only easy — it lets them drill out the round faster.

No Stuck Steels! Positive air feed keeps drills working at peak efficiency, avoids stuck steels.

Higher Drilling Speeds! Positive air feed plus proper force of blow and strong rotation give faster drilling speeds with both steel and tungsten carbide bits. You get longer bit life, too, and drill more footage.

Low Upkeep Cost! No feed screws or feed-screw nuts to wear. No complicated power-feed mechanism to give trouble.

Easy to Operate! Built to lighten the load on your miners. Feed controls conveniently located. Reverse air feed withdraws steel from hole quickly.

Faster Set-ups! The combination of Le Roi-CLEVELAND Air Feed Drifters and air columns gives you a unit that can be set up easily and quickly. And you can get the air column in any height you want.

drilling cycles

Le Roi-CLEVELAND *self-leveling* Mine Jumbo with four-foot steel-change Air Feed Drifter

Saves time drilling lifters! Lets your miners drill the right round for any ground!

You couldn't ask for more from a mine jumbo than the performance you get from this new Le Roi-CLEVELAND. It's got plenty of stuff. And the payoff for you is faster cycles, greater tonnage per man-shift, lower costs! Here's why:

Self-leveling, air-motor-powered arm, lets miners spot and space holes quickly and easily, for the most efficient fragmentation. They don't have to loosen a bolt or tilt a boom, to complete the drilling cycle.

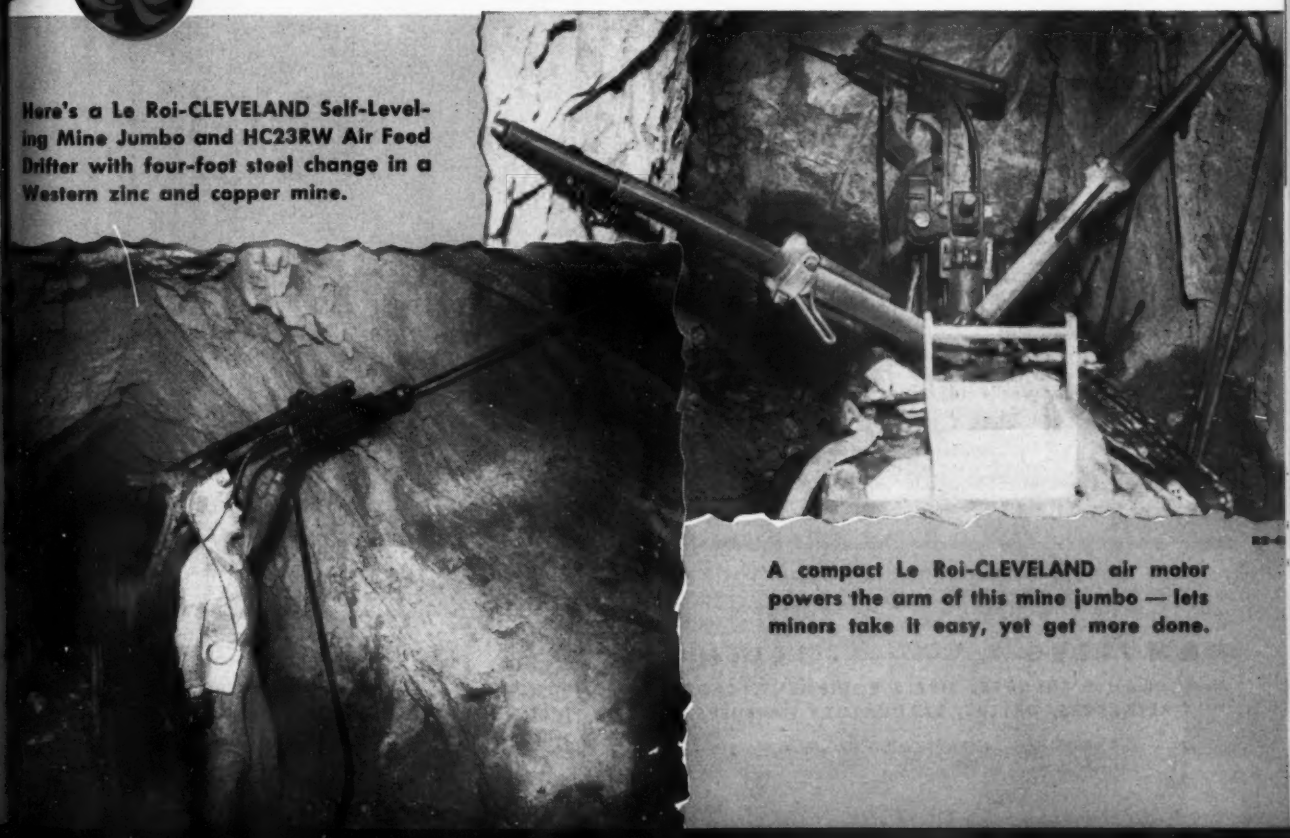
Exclusive rigid screw and gearing mechanism keeps the heading straight, cuts down overbreak and underbreak. Keeps the drifters in line, prevents the steel from binding, reduces chuck wear.

Offset arm provides plenty of clearance to drill lifters — without having to take time out to swing the drill under the arm.

You can get this Le Roi-CLEVELAND Self-Leveling Mine Jumbo in either single-arm or double-arm construction. Write for further information and see for yourself how either model can help you get more done every shift.

LE ROI COMPANY
A Subsidiary of Westinghouse Air Brake Co.

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, O.



Here's a Le Roi-CLEVELAND Self-Leveling Mine Jumbo and HC23RW Air Feed Drifter with four-foot steel change in a Western zinc and copper mine.

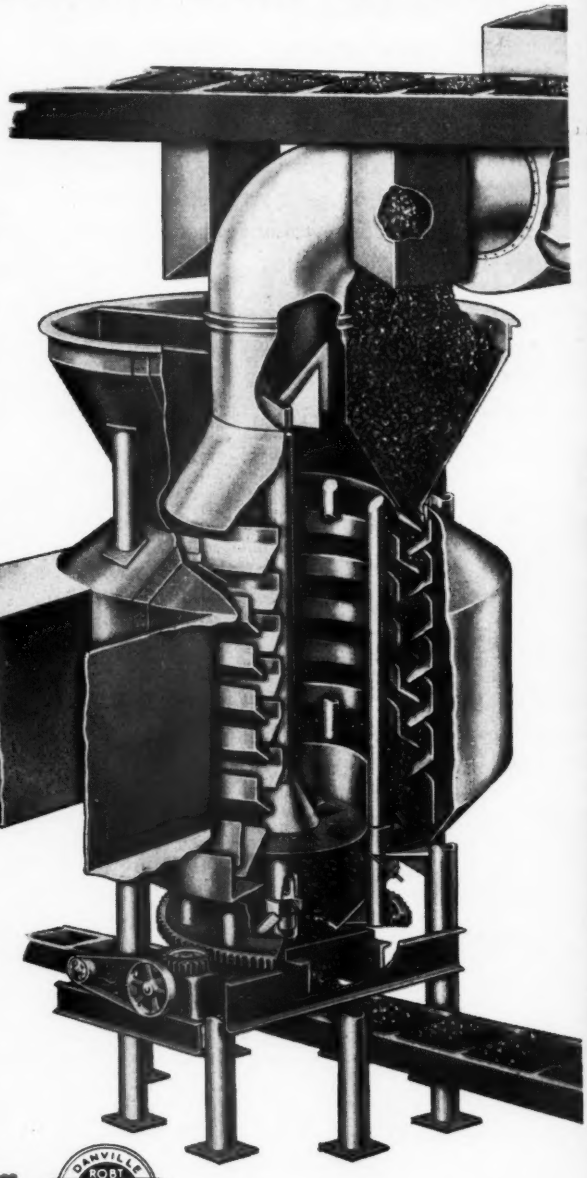
A compact Le Roi-CLEVELAND air motor powers the arm of this mine jumbo — lets miners take it easy, yet get more done.

RS-4

Baughman

DRY up to 60 tons of COAL per hour in one pass...

VERTI-VANE THERMAL COAL DRYER



AT LOW INITIAL COST... LOW OPERATING COST, the Baughman Verti-Vane Drying Unit delivers a uniformly dried and well-mixed product with practically no degradation.

Each unit is designed for capacities ranging from 15 to 60 tons per hour, and handles all coal sizes from 1½" down. Reduces surface moisture to approximately 2% in a single, continuous operation. No re-run is ever necessary.

A minimum of moving parts and slow-speed operation tend to eliminate shift breakdowns and keep replacement costs to a minimum. Controls are easily adjusted for various feed conditions so that operation of the unit requires very little attention.

For Free Catalog No. 101 and Complete Information Write Dept. C-8

Stop Breakage Losses with

HOLMES LOWERING SPIRALS

Eliminates droppage that degrades your coal. Saves wear and tear on bins. Costs nothing to operate (gravity operated). Centrifugal force is utilized to hold coal on spiral . . . inside edge or "lip" on spiral is unnecessary . . . allows coal to slide gently off and spread evenly upon reaching peak of pile. Coal flow on spiral is automatically controlled and remains within "safe" speed limits regardless of distance of travel.

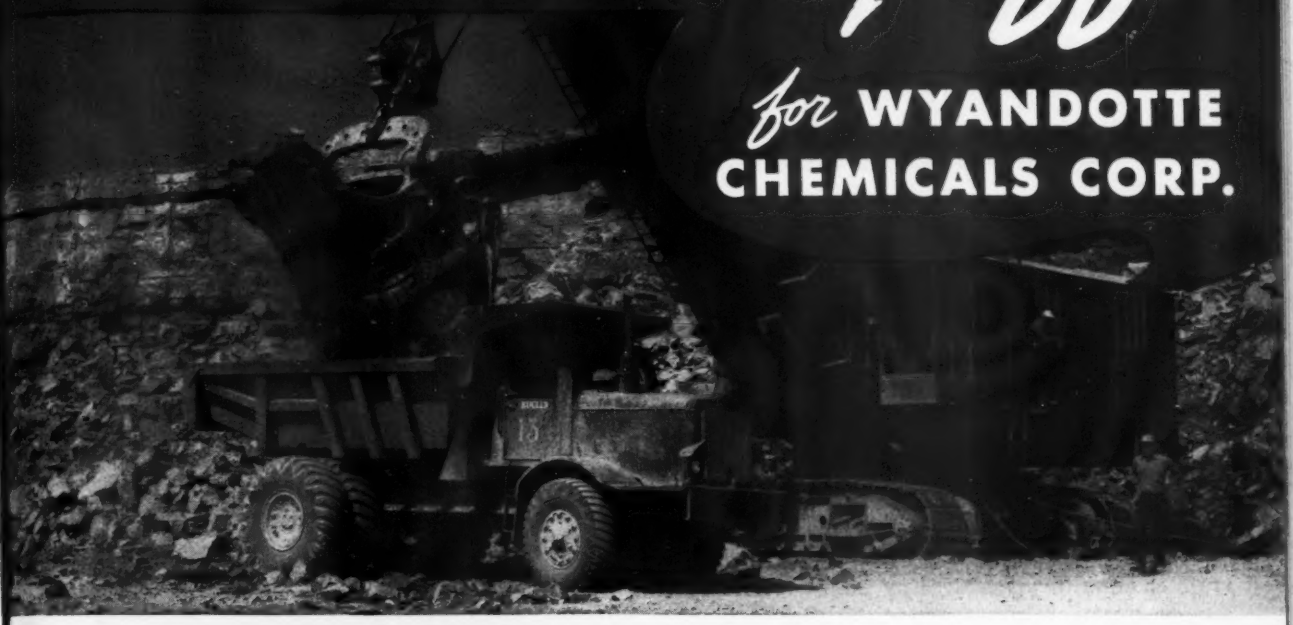
ROBERT HOLMES & BROS., Inc.

DANVILLE • ILLINOIS

Manufacturers of: SHEAVES, TIPPLE EQUIPMENT, CAGES, SKIPS, LOWERING SPIRALS, CAR PULLERS AND RETARDERS, DRYERS, LABORATORY CRUSHERS, HOISTS, VIBRATING SCREENS, DUSTOLATORS.

"Eucs" Pay Off

for WYANDOTTE CHEMICALS CORP.



22,000 hours...still going strong!

At Alpena, Michigan, Wyandotte Chemicals Corp. operates one of the world's largest limestone quarries—another job where "Eucs" are paying off in more loads per hour at less operating and maintenance cost.

Seven years ago Rear-Dump Euclids of 22-ton capacity replaced an electric haulage system for moving rock from the quarry face to the plant. Loaded with stone by shovels of 5 and 6 cu. yd. capacity, and hauling overburden during the winter months, these fourteen "Eucs" have worked an average of 22,000 hours each. On a two mile round trip haul, each "Euc" delivers approximately 75 tons per hour for a total of more than 3 million ton-miles per unit.

Wyandotte standardized on Rear-Dump Euclids because of their job proved dependability on hundreds of mine and quarry operations. Performance records prove this decision has paid off because "Euc" speed, capacity and efficiency have increased production and lowered hauling costs at Alpena.

Your nearby Euclid distributor will be glad to discuss your off-the-road hauling problems and show you how and why "Eucs" can do a better job for you.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

EUCLID THE PIONEER

GM GENERAL MOTORS

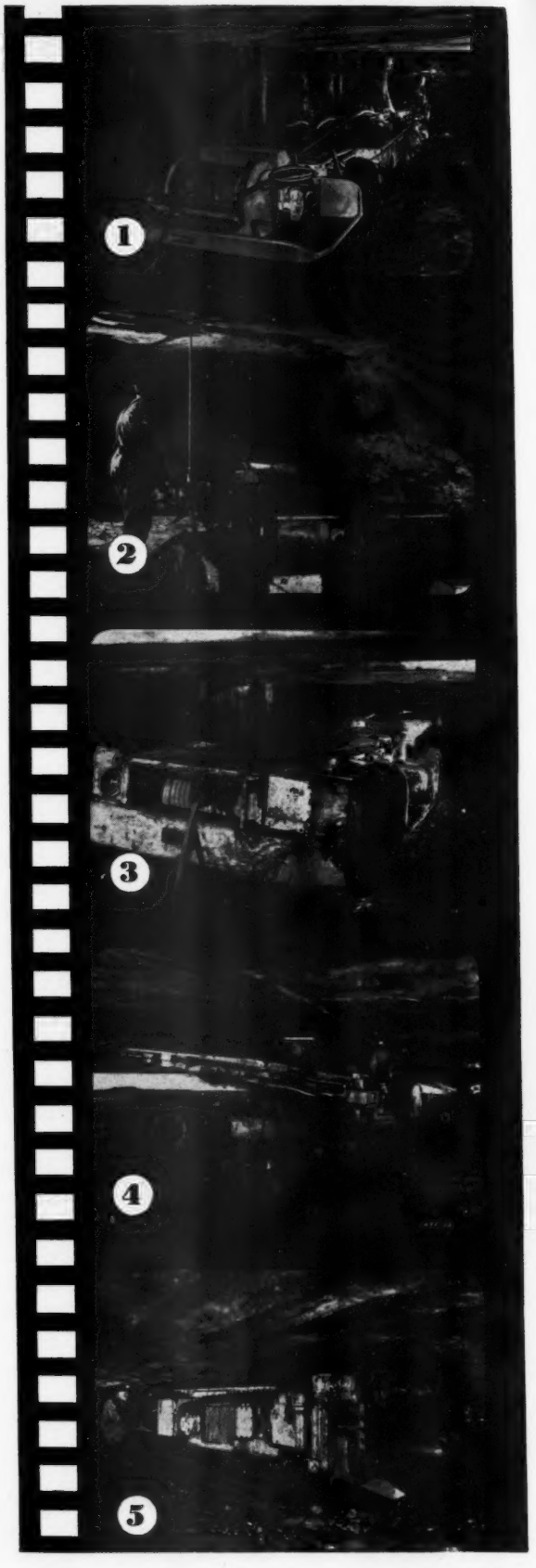
wherever coal is mined

JEFFREY equipment is in the picture !

With high labor costs, mechanized mining equipment is your best way to meet competition.

Jeffrey offers a wide range of cost-cutting units suited to your specific condition . . . to cover coal mining underground and topground. Some of them are shown here.

Our experienced, highly-trained engineering staff is capable of providing sound technical advice. If you are concerned with rising costs . . . it's time you found out about Jeffrey equipment.



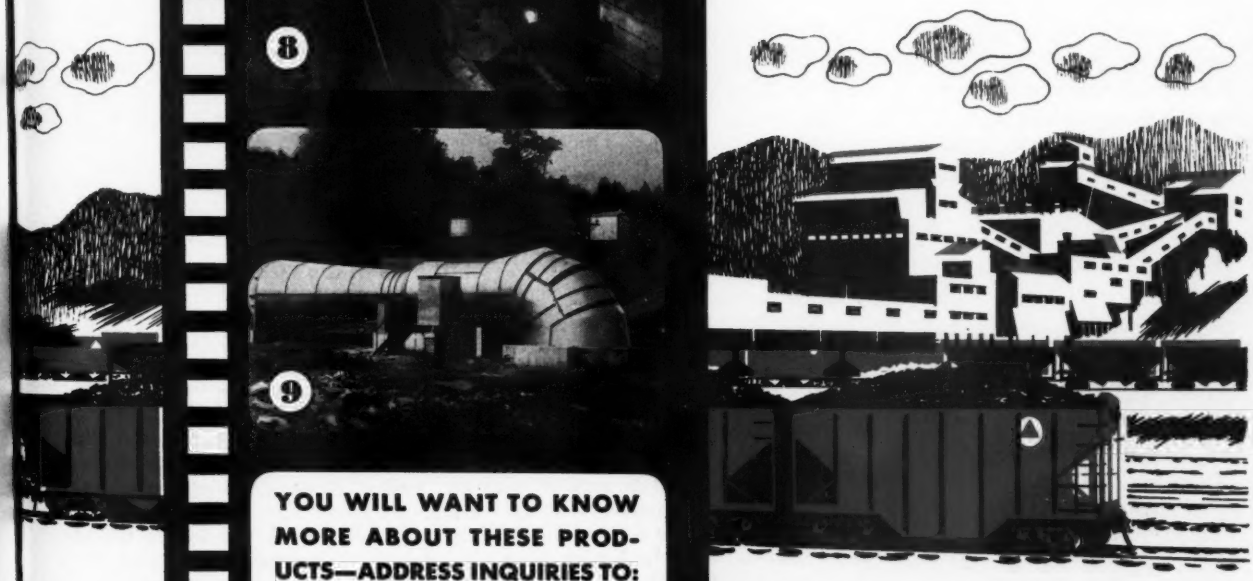
1. **56-FHR DRILLING MACHINE** with wide adjustments permits locating holes in the face for most efficient shooting. All functions hydraulically controlled – holes drilled to required depths at any angle. Bulletin No. 831.
2. Type **56 RDR ROOF DRILLING MACHINE** in operation. Can be arranged to put water on the drill bit, or equipped with dry dust collector. Adjustable torque wrench provides tightening of bolts to a uniform predetermined value of torque.
3. **70-UR UNIVERSAL CUTTING MACHINE** for high-productive coal cutting – mobile, compact, rugged and speedy in operation. Rotatable and adjustable cutter bar makes a vertical or horizontal cut any place in seam – 11" below floor level to 13' above. Catalog No. 835.
4. **81-A CRAWLER-LOADER** for a new experience in efficient low-cost loading. Available in two heights with 10 or 15 H.P. motors. Rated capacities 6 and 8 tons per minute.
5. The **COLMOL** marks a new era in coal mining. A powerful, rugged machine – mines and loads in one operation without use of explosives. Advances continuously into a solid seam at the rate of 15" to 24" per minute. Removes coal from an area 9½' wide by 38" high and up.

6. **SHUTTLE CARS** are available in 24" to 54" basic heights — capacities up to 10 tons. An elevating discharge conveyor for unloading directly into mine cars or to main haulage conveyors is standard. Flexibility increases production — cuts cost. Models MT66, MT67 and MT68.

7. **CONVEYORS** in both chain and belt types meet capacity requirements under varying conditions and types of service. A wide range of sizes at low initial investment. Catalog No. 820.

8. **JEFFREY LOCOMOTIVES** have served the industry for more than 60 years. As more mines became mechanized, Jeffrey developed locomotives of greater capacity to haul increased tonnages. Available in trolley, cable-reel and storage-battery types. Catalog No. 836.

9. **JEFFREY AERODYNE FANS** may be arranged to force air into the mine or to exhaust air from it. Easy adjustments up to seven different blade positions. For safe, adequate mine ventilation investigate Jeffrey AERODYNE Fans. Catalog No. 797.



YOU WILL WANT TO KNOW MORE ABOUT THESE PRODUCTS—ADDRESS INQUIRIES TO:

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA.

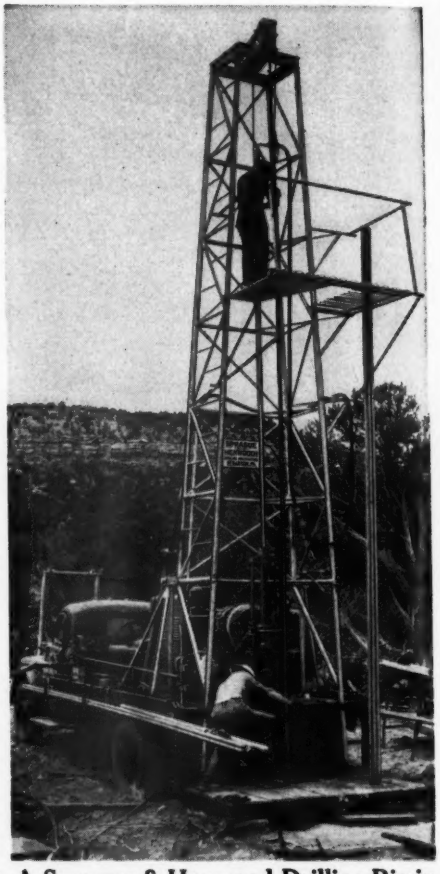
IF IT'S MINED, PROCESSED OR MOVED
. . .IT'S A JOB FOR JEFFREY!

CONTRACT DIAMOND DRILLING

Anywhere Any Time

For more than sixty years Sprague & Henwood, Inc. has been a leader in the field of Contract Diamond Drilling. During this long period of time our crews have completed thousands of contracts successfully in every corner of the globe—under every conceivable operating condition. Today we have a large force of expert operators and an ample supply of modern equipment, so that we can undertake almost any job—anywhere—on very short notice.

Besides exploratory core drilling, from the surface or underground, our service includes blast-hole drilling, directional drilling, foundation test drilling, grout-hole drilling and pressure grouting. Estimates, and constructive suggestions when possible, submitted promptly on request.

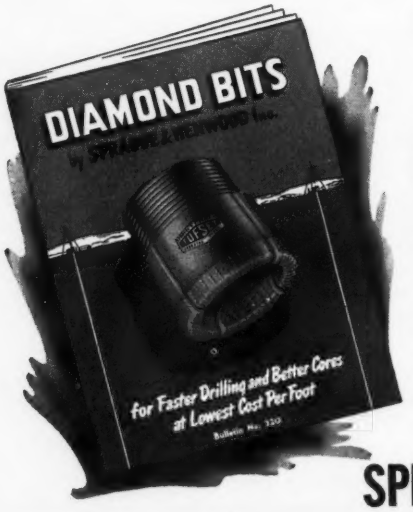


A Sprague & Henwood Drilling Rig in the Colorado Uranium Field.

High-Speed Core Drilling Machines

and Complete Accessory Equipment

The same high-speed core drilling machines and improved accessory equipment that we manufacture, in our own extensive shops, for our own requirements, is equally available to other operators and can be relied upon for best-possible all-round results at lowest ultimate expense. Model 40-C is our latest core drilling machine and is recommended for holes up to 1000 ft. in depth. Other modern machines provide for deeper core drilling and for either blast-hole drilling or core drilling underground. Write for illustrated bulletins.



"ORIENTED" DIAMOND BITS

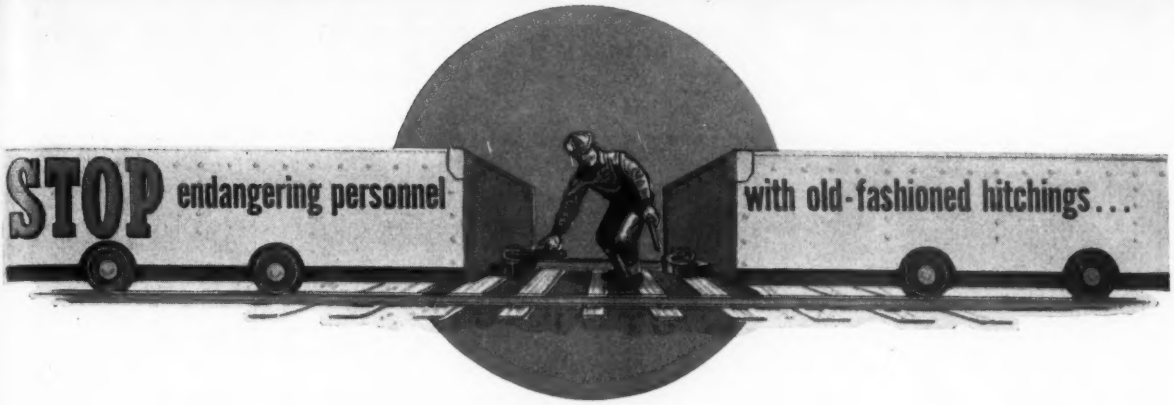
Cut Faster—Last Longer—Cost No More

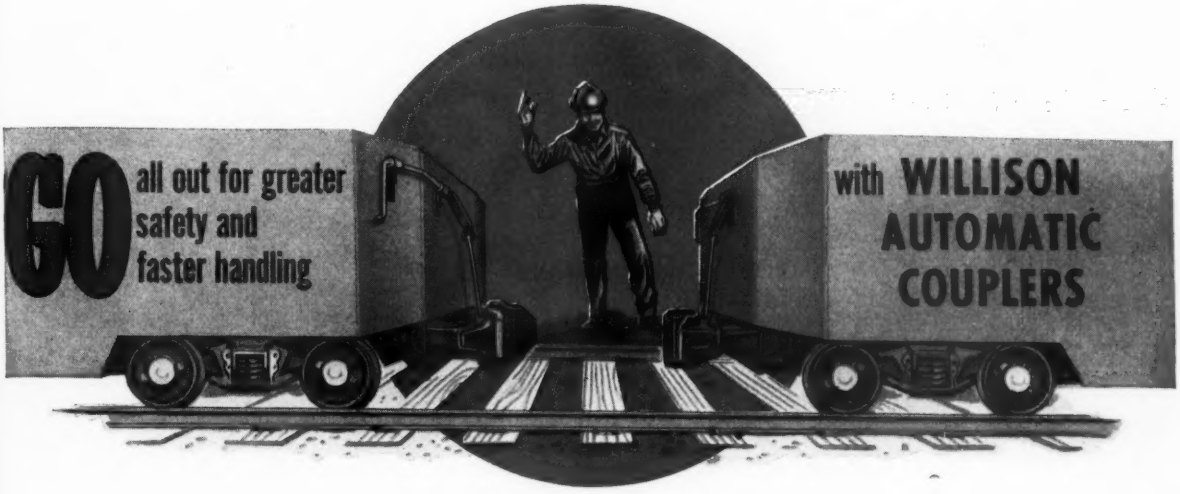
Always a leader in its field, Sprague & Henwood, Inc. pioneered the development of oriented diamond bits, in which each individual diamond is set with its hardest edge or "vector" toward the work and has proved by extensive comparative tests that they last much longer and cut much faster than ordinary bits in which the diamonds are set at random. Only selected diamonds of suitable crystaline structure can be used and only specially trained and equipped setters can be relied upon to orient the diamonds correctly in the mold, but we are now fully organized to produce Oriented Diamond Bits efficiently and are furnishing them at no additional charge.

In terms of Footage Cost, these are the Most Economical Diamond Bits ever produced and we invite inquiries on that basis. Bulletin 320 illustrates and describes all types and gives complete working data.

SPRAGUE & HENWOOD, Inc., Scranton 2, Pa.

Branch Offices: New York • Philadelphia • Pittsburgh • Grand Junction, Col. • Buchans, Newfoundland





With Willison Automatic Couplers there's no need for personnel to go between cars to couple or uncouple. That means safety—and faster handling because Willisons uncouple from either side. All Willisons couple with each other automatically—there's no matching of coupler heads.

For safety, faster handling and larger tonnages—Willison Automatic Couplers and National Multi-Pad Rubber Draft Gears.

A-9031

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

WILLISON AUTOMATIC COUPLERS • RUBBER & FRICTION DRAFT GEARS • NC-1 CAR TRUCKS
NACO STEEL WHEELS • NACO STEEL LINKS & SWIVEL HITCHINGS

More net hp--greater live wt!

A K-360 has both and *Speed-o-Matic* too! And that means more taconite production at lower cost

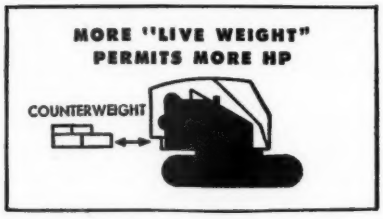
E. A. YOUNG, inset, assigned his company's Link-Belt Speeder K-360 to some of the toughest digging on the range—tough shot taconite. In 1400 hours' operation during 1953, the Speed-o-Matic-controlled rig averaged approximately 120 yds. per hour.

This outstanding performance is due to three important advantages the 1½-yard K-360 offers. (1) It delivers 142 *net* or usable hp. (2) It's got the built-in stamina or "live weight" necessary to stand up under continuous use of extra hp. And (3), the K-360 has Speed-o-Matic, the true power hydraulic control system.

For information on the K-360, see your Link-Belt Speeder distributor or write for catalog 2259.

LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa

13,473



COMPARE 1½-yd. shovel-cranes with and without counterweight. That test spotlights the size, weight and heft built into the working parts and structure. You'll find the K-360 has greater "live weight."

BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

LINK-BELT SPEEDER

Photograph by Howard Lucas

For Moving Mountains...or Digging Coal...

Standardize on AMERICAN Explosives and Accessories

Wherever the stroke of the detonator sets the earth shaking, American blasting materials help speed the work.

Experienced shooters everywhere rely on American explosives because they know they're dependable—that they're produced by modern methods and under strict laboratory control to give the results that shooters want. Available in a wide range of densities, velocities and strengths, American explosives are designed to do your job best—because constant field research tells us what you need. Capable field engineers are available at your call.

HIGH EXPLOSIVES • PERMISSIBLES • BLASTING POWDER • BLASTING ACCESSORIES

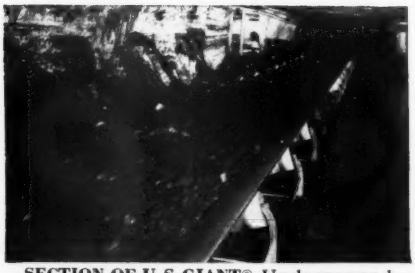
AMERICAN Cyanamid COMPANY

EXPLOSIVES DEPARTMENT

30 Rockefeller Plaza, New York 20, N. Y.

Sales Offices: Pittsburgh, Pa., Bluefield, W. Va., Scranton, Pa., Chicago, Ill., Pottsville, Pa., Maynard, Mass.

U.S. Rubber belting "takes its lumps" and likes it!



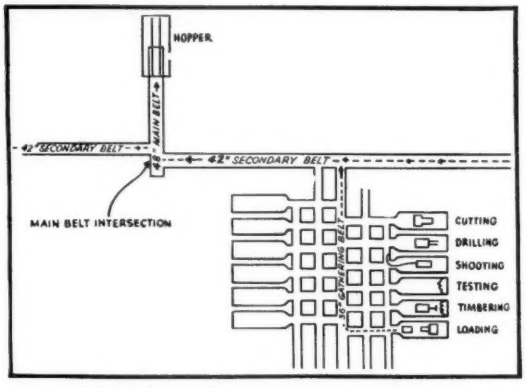
SECTION OF U.S. GIANT® Underground coal belt serving as main haulage belt (below). Coal being loaded from 36" U.S. Giant gathering belt onto 42" U.S. Giant secondary haulage belt.

SCENE:—Mine No. 10 of the Peabody Coal Co., Illinois. Daily capacity, 12,000 tons. For haulage, belting is used exclusively.

PROBLEM: The use of compressed air to break down the coal invariably results in a high percentage of large lumps. The average belt can't take such a beating for long. What to do?

SOLUTION: United States Rubber Company engineers were called in to help in the pioneering and design of the world's most modern underground coal handling system. Using the famous "U.S." Three-way Engineering (in which "U.S." engineers work with the mine operators *and* the designers of the conveyor system) gathering belts, secondary haulage belts, transfer belt and main haulage belt—all made by "U.S."—were installed. These belts stand up easily under the constant battering of the large lumps. Troughability and proper training completely eliminate spillage even at peak loadings as high as 2400 tons per hour.

Take *any* conveyor belt problem—large or small—to "U.S." There are sales engineers at your service at any of our 25 District Sales Offices. "U.S." belting service is also obtainable from any of our selected distributors. Or write address below.



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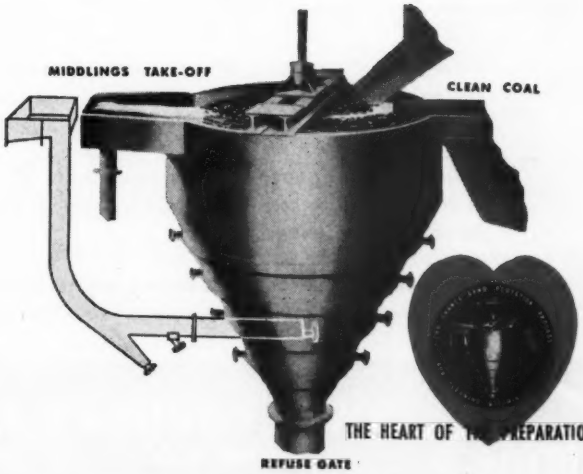
The new middlings take-off is optional with new equipment and can be fitted to cones already installed.



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Try a Joy Air Leg and LM-47 Drill. You'll agree they are a perfectly matched pair and present something new in easy, efficient drilling and handling.

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W&D 4944

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EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

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EQUIPMENT: 3½-mile long Hewitt-Robins Belt Conveyor System consisting of nine sections: six 30" standard heavy-duty underground mine conveyors, one 36" slope conveyor and two 36" surface conveyors.

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RESULTS: The performance of this installation has been quite satisfactory from the standpoint of both Operating and Maintenance Costs.

Engineering Data

MINE-TYPE SHUTTLE CONVEYOR: The answer to truly continuous mining . . . it follows the working face and at the same time maintains a fixed transfer point through a fixed tripper—unit is extendable and retractable up to 600'.

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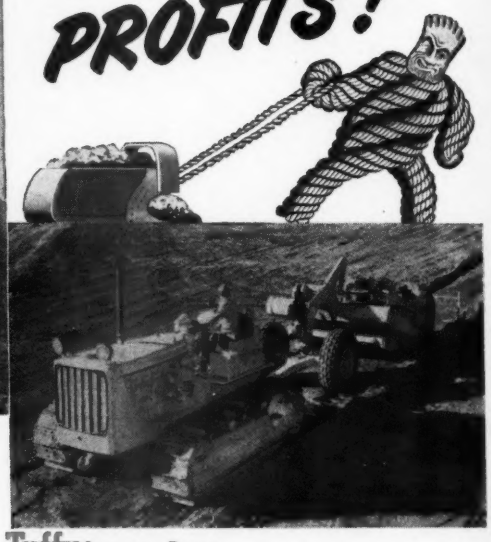

Figure It Out—Tuffy Drags often give up to *twice* the service of other ropes used for draglines! How much in dollars and cents would you save by cutting your dragline replacement costs in half? The super strength and extra service life of Tuffy Dragline can make an important difference in your operating costs.

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Try Tuffy Dragline on your strippers. Compare the service you get from Tuffy to the service you get from other draglines . . . and see how much more cents-a-ton profit Tuffy Dragline can make for you!

Tuffy Scraper Rope
Flexible enough to withstand sharp bends . . . stiff enough to resist looping and kinking when slack . . . tough to stand off drum crushing!

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Designed to take the punishment of small winch drums and small sheaves . . . the shock of blade manipulation under toughest going!

Tuffy Slings
9-part, machine braided wire fabric construction is extra flexible, extra strong!

Tuffy Slusher Rope
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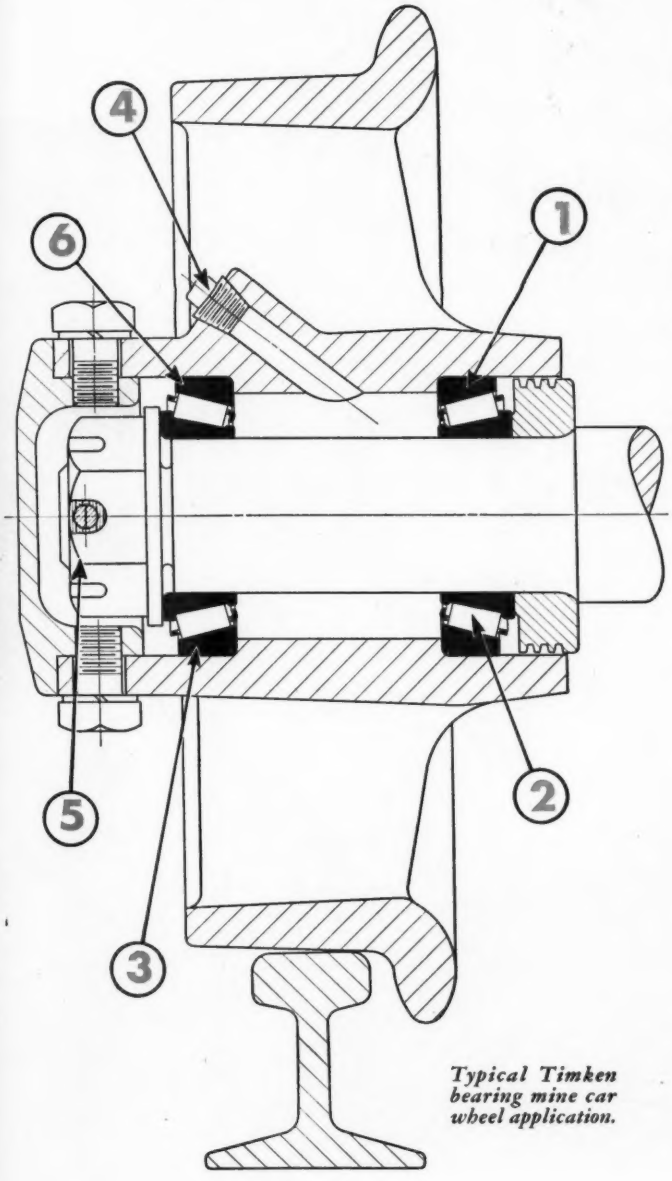
Specialists In High Carbon Wire, Wire Rope and Braided Wire Fabric

6 WAYS HAULAGE COSTS HAVE BEEN CUT ON OVER 500,000 MINE CARS



Typical Timken bearing mine car wheel application.

MINE operators have cut haulage costs these six ways by mounting over 500,000 mine cars on Timken® tapered roller bearings:

1. **LESS MAINTENANCE AND REPAIRS.** Timken bearings take the pounding of mine car service with minimum time out for maintenance and repairs. One reason—to find steel good enough for Timken bearings, we make our own. (Something no other bearing manufacturer does.) Rollers and races are case-hardened to give them hard, wear-resistant surfaces and tough, shock-resistant cores.

2. **GREATER LOAD CAPACITY.** Because of line contact between rollers and races, Timken bearings have extra load-carrying capacity.

3. **MORE CARS PER TRAIN.** Timken bearings let you haul more cars per train with no increase in power requirements. The true rolling motion and incredibly smooth surface finish of Timken bearings practically eliminate friction.

4. **LESS LUBRICATION.** Lubricant stays in Timken bearings—mine dirt, dust and moisture stay out. Closures are more effective because Timken bearings keep hubs and axles concentric.

5. **SIMPLIFIED INSPECTION.** Wheels can be easily removed for bearing inspection by simply pulling the cap, cotter pin and nut.

6. **NO NEED FOR SPECIAL THRUST PLATES.** The tapered construction of Timken bearings enables them to take radial and thrust loads in any combination. No special thrust plates are required. Cars take curves easier.

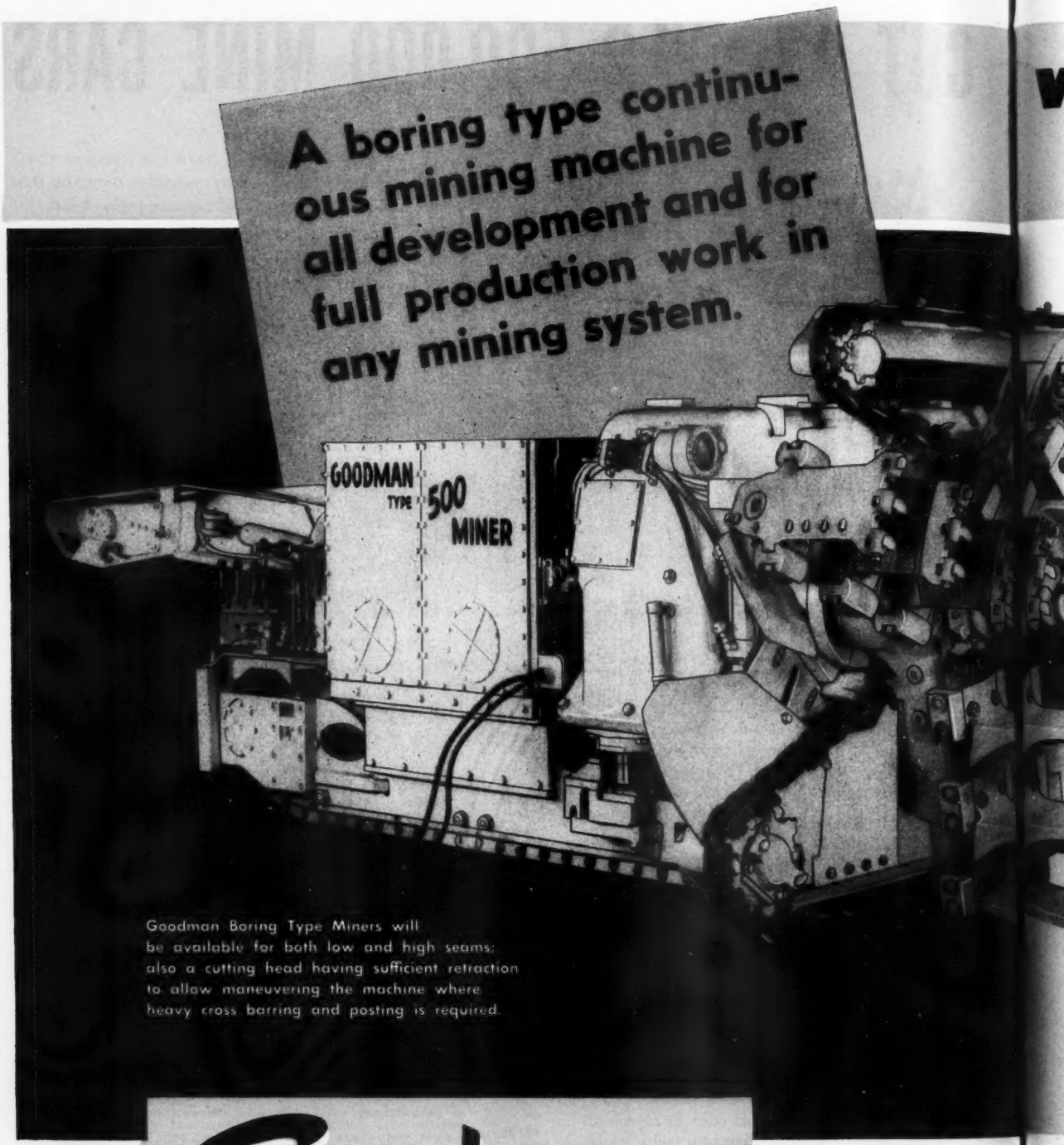
You can always get these cost-cutting benefits for your mine cars by always specifying Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

Cut your hauling costs by specifying **TIMKEN** TAPERED ROLLER BEARINGS

TRADE-MARK REG. U. S. PAT. OFF.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST → ← LOADS OR ANY COMBINATION →

More tons per man.. ..



Goodman Boring Type Miners will be available for both low and high seams; also a cutting head having sufficient retraction to allow maneuvering the machine where heavy cross barring and posting is required.

Goodman
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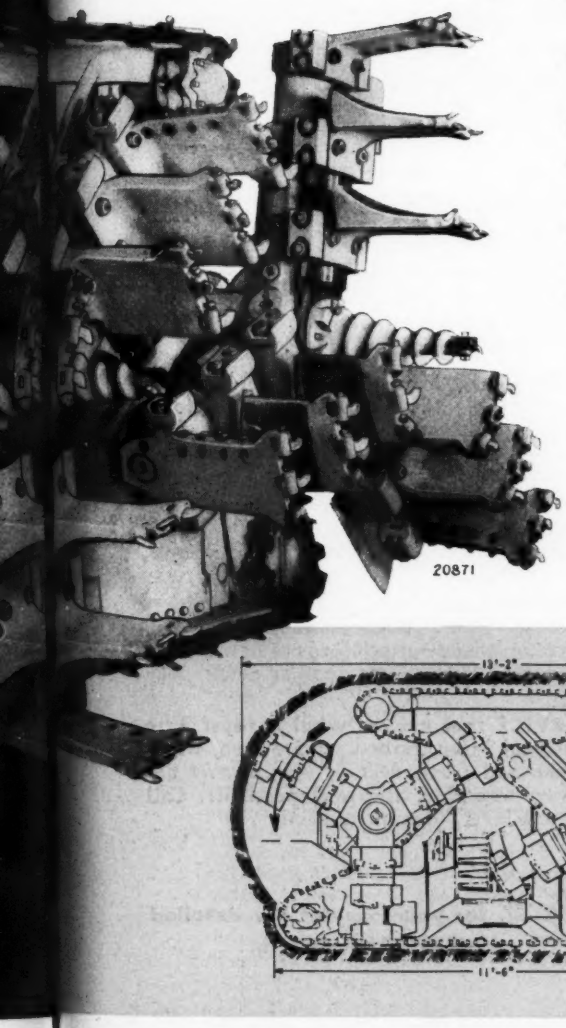
CUTTING MACHINES

..lower cost per ton

with the GOODMAN type 500 MINER



- **cuts and loads up to 7 tons per minute from the solid, unprepared seam**
- **produces high percentage of lump coal, with unusually low percentage of fines**
- **cuts wide path at a single thrust without swing or maneuver**
- **crosscuts can be turned at 90° angles; seam irregularities can be followed by vertical or lateral tilt of entire cutting element**
- **for ease in withdrawing from cut and for tramming, clearance at top and sides is provided by retraction of cutting units**
- **cutting arms rotate at 14 rpm, a safe rate with no rapidly moving parts, no flying coal. Dust is at a minimum, easily spray controlled**

A rugged machine of surplus power and capacity. Simplicity and strength, with fewer and stronger parts than most mining machinery, promotes maintenance economy.

A completely flexible machine. Maneuverability is made fully effective by reversible tractor treads, conveyor swing, retraction and tilting of cutting units.

A unique hydraulic system consisting of three pumps, each of which can be operated by finger-tip control for (1) tramming; (2) conveyor chain motion; (3) cylinders that motivate tilting, retraction and conveyor swing.

The path it cuts is arched at sides and top corners for strong roof support, and is wide and flat at the bottom, completely cleaned for a good roadway.

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IMPORTANT SAVINGS IN MAINTENANCE LABOR WITH

WHEAT

ELECTRIC CAP LAMPS

Compare WHEAT LAMPS with any other individual light for the miner and you find self-evident savings in maintenance labor costs. *Check these points:*

ROCK-BOTTOM MAINTENANCE—Regular watering, ordinary cleanliness, occasional bulb replacement sums it up!

MAXIMUM SIMPLICITY—You spend no time in opening covers, cleaning terminals, freeing valves, re-solutioning cells—*none of this* with WHEAT. You profit by the difference!

ONE-TWO RENEWAL—When battery replacement time comes around, just disconnect headpiece—attach leads of new battery—you've a WHEAT as good as new!

SERVICE ***that proves what it says!*** The National Mine trained service men, warehouse and truck fleet *in your district* are always available, always dependable. Call for a WHEAT demonstration!

the TREND is to WHEAT

Write **for your copy of the detailed WHEAT LAMP Bulletin**

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HAS THE FACILITIES—DELIVERS THE GOODS

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NOW!

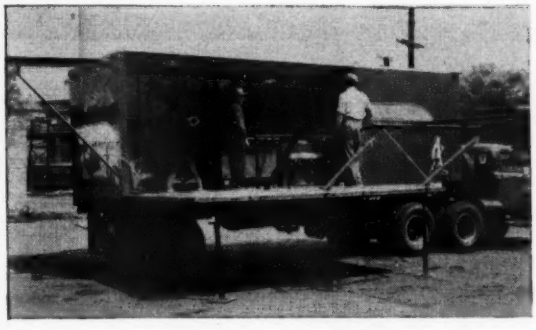
you can get big drill performance with the

CHALLENGER
Blast Hole Drill

HERE'S WHAT USERS SAY:

"Drilling cost per ton of ore broken reduced by two-thirds over wagon drills. Driller experience can further reduce to one-sixth of wagon drilling cost."

"Punched down four 60′ holes, bottoming at 4″ dia., in one shift. What a drill!"



SPECIAL DRILL AND STEEL SERVICE

The size of the Challenger Drill and the sectional steel used with it, makes necessary special drill and steel service which is provided by Joy. Service trucks, like the one shown here, make periodic visits in areas where Challenger Drills are operating. The operators of this "mobile shop" are experienced drill doctors who furnish complete drill steel service, bit sharpening service, drill inspection, and suggestions for use and application of the drill for best results.

Users' reports on early units show that you really get big drill performance with the Challenger Drill. It's a 5¼" hammer drill (not a piston drill) that drills 4½" diameter holes through hardest rock to depths of 50′ or more. This big drill performance calls for a 26′ feed to cut the number of steel changes, and a self-propelled mounting. Tractor-mounted on rubber tires with a portable compressor to furnish air for drilling, the Joy Challenger is the biggest cost-cutting big drill for hard rock drilling. Check your needs . . . see if this big drill won't answer your problems. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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W&D C 4838

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There's plenty of "drag miles" in U. S. ROYAL SHIELDED TRAILING CABLES

The constant dragging, flexing, twisting and bruising encountered in heavy service do not bother U.S. Royal Shielded Cables. The rugged jacket contains 60% by weight of neoprene; this jacket is cured in lead—all for more durability, more "drag miles". Consider also more than just the initial cost! Achieve a new low in your cable replacement costs—a new high in performance by specifying U. S. Royal Shielded Trailing Cable, the cable that can take a beating and come back for more.

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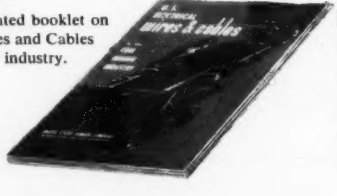

Here's the key to U. S. Royal's great performance; United States Rubber Company is the only electrical wire and cable manufacturer to grow its own natural rubber, manufacture its own synthetic rubber and its own plastics. This means *control of production* every step of the way—resulting in a better and more efficient product.

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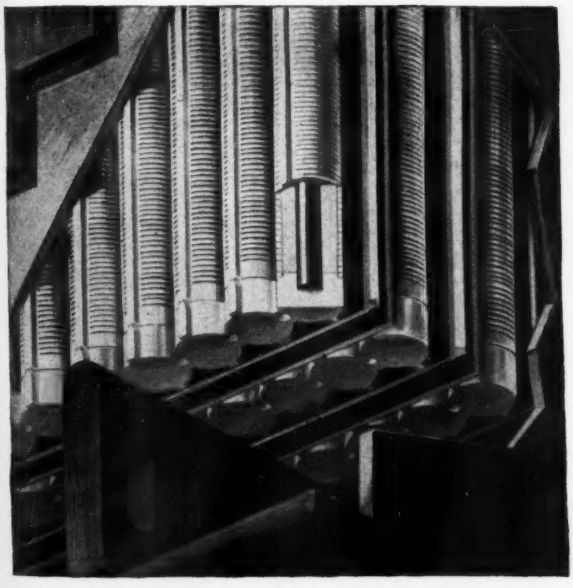
SPEED UP YOUR HAULAGE AND SAVE

. . . with low cost Exide-Ironclad power!

YOU CAN count on Exide-Ironclads to help speed up car changes, keep loaders busy and main line haulage moving fast. This means you get more trips per shift, more production per man-hour with less cost per ton handled. Exide powered equipment will handle as much tonnage during the last hour of the shift as during the first. Lower costs for operation, maintenance and depreciation make Exide-Ironclad batteries your best power buy—AT ANY PRICE!



THE POSITIVE PLATES are the heart of any battery. Only Exide uses a slotted tube construction. By use of tubes, more active material is exposed to the electrolyte, providing *greater power*. Also, more active material is retained, giving *longer working life*.

THE NEW THRIFTY HAULER! The improved shuttle car battery using *non-oxidizing* plastic power tubes for longest battery life, more capacity in the same space. For full details, call your Exide sales engineer—write for Form 1982 (Installation and Maintenance of Motive Power).

Your best power buy
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IRONCLAD® BATTERIES

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$108 Saved Each Working Day On Trip Riders Alone . . . . .

How Much Would The Advantages Below Save You?

REGENT SLOPE MINE SAYS:

- "We'd need at least six trip riders—if we didn't have O-B Couplers—at about eighteen bucks a day per man."
- ". . . hasn't been one coupling accident in this mine since we got O-B Couplers over six years ago."
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- "We don't have any runaway cars or broken trips."
- "We save valuable time the way O-B Couplers automatically couple on contact. No hands needed."

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"Look what rib-pinching does to our shuttle car cable!"

"Sometimes the cable gets cut almost in half. And that's dangerous to the men. So we have to shut the machine down to make a splice. That costs money. Run-overs, rock splinters and sharp corners between the face and the main tunnel are tough on the cable! How can we make our cable last longer under these conditions?"

"Well, a few simple things can help you double cable life."

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Here's why AnacondA shuttle car cables last longer

Did you know that recent surveys in 15 mines show ANACONDA flat-twin cables today last 300% longer than cables used on shuttle cars only a few years ago? Here's why. These cables have a *specially-compounded* neoprene jacket. You can't cut, tear or abrade it easily. Insulation is a new, harder-wearing form of cold rubber. An improved stranding, and a brand-new ground strip make this cable a lot tougher and a lot safer to handle.

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Editorials

JOHN C. FOX, *Editor*

APRIL, 1954

Spring Cleaning

IN a special section of this issue we present a preview of the 1954 American Mining Congress Coal Convention, to be held May 3-5 in Cincinnati.

This is the forum where each year the coal industry takes its own measure. Here the past is reviewed, the future examined and both are compared with the present. The candid analyses that are made at these meetings each spring serve to brush away the cobwebs of pessimism that may have gathered during the winter.

Since 1947, when an all-time peak production of 688,000,000 tons of coal (bituminous and anthracite) was recorded, output has dropped some 200,000,000 tons. In considerable part this falling off appears to be an adjustment following the heavy demands of war and immediate post-war years. There are good indications, however, that the production curve is leveling off and that the lowest level of production is at hand. A tentative forecast places 1954 production only three percent under that of 1953. There will probably be little, if any, more loss to competitive fuels. Instead, output will have to be increased to meet the demands of coal's rapidly expanding new markets. It is confidently predicted by recognized authorities that before the next 20 years have passed a billion or more tons of coal will be required each year.

So much for the long range view. A billion tons in 1975 is small comfort to the operator faced with the problems of staying alive today and tomorrow. Well, it is a matter of record that bituminous coal consumption was almost 20 percent greater than production during the first quarter of 1954. By the end of March users' inventories were lower than at any time since the end of the 1950 strike era. This inventory loss will need to be made up this year and the use of coal is destined to continue to rise, from month to month and year to year.

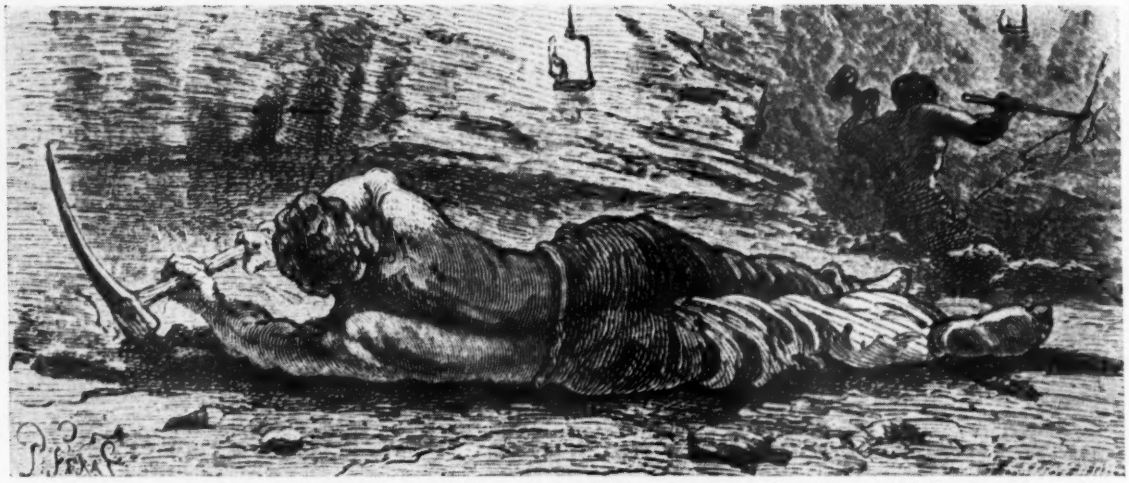
Coal now provides 66 percent of the fuel used by the electric power industry and the blueprints for many new power plants call for coal as the source of energy. The Atomic Energy Commission will be using 23,000,000 tons of coal a year when the various installations it has under construction or on the drawing boards are finished. The chemical industry already has multi-million dollar investments in plants to turn coal into basic organic chemicals, and more to come.

Research, $15,000,000 worth of it a year supplied by the industry itself plus $7,600,000 more provided by Government, is rapidly developing ways to recover much of the domestic and small commercial heating market lost to other fuels. Research will also result in an eventual turning of the tables with coal supplying much of the synthetic gasoline and fuel gas our nation will need.

Coal has accomplished much. It has powered the nation when the chips were down. It will continue to do so. At the same time it will bring present dreams to future reality and will throw its strength into the establishment of new industries as yet undreamed of.

When the cobwebs that have gathered during the dark months are brushed away and the light of the rising sun is allowed to stream in through the window, things sure look different.

A little Spring Cleaning helps a lot.



Coal was undercut with a pick and then wedged down by hand before the advent of explosives. This drawing was made in about 1850

A Short History Of Coal Mining

By GEORGE W. SALL

THE history of coal antedates the birth of Christ. And the Greeks, as they had for most things, had a word for it—"anthrakites."

The earliest known reference to coal was made about the year 351 B.C. by a student of Aristotle, who described stones which burned like charcoal and were found in what is now the province of Genoa, Italy, and in northern Greece. The Romans may have used coal in England after their invasion of that island in 55 B.C., but when interpreting the writings of the era it is hard to tell whether they meant coal, or charcoal. Coal cinders have been found in ruins of their villas and towns near which well-known seams outcropped. However, it is not known how widespread this use of coal was. During the same time the Romans were uncovering coal outcrops in France while building aqueducts, but apparently did not use it as fuel.

According to the Encyclopedia Britannica, the first recorded use of coal in Great Britain is frequently stated to be 852 A.D., when it was noted in the Saxon Chronicle of the Abbey of Peterborough that the Abbot there leased some land for the yearly rent of "60 loads of wood, 12 loads of coal, six loads of peat, etc." The reference to coal here, however, might very well have been to charcoal, as no mention was made of coal or coal mining in the Domesday Book compiled in 1085. The Domesday Book was a survey ordered by William the Conqueror which was to be a record of all things having economic value in England. It is said to have included the counting of every sheep, egg, dog and chicken, and although lead and iron mining was mentioned, nothing was said of coal.

England and China Led

While England led the western civilizations in the development of coal uses and mining, China was the leader in the east and perhaps the world. The first known mention of coal in Chinese literature is found in the writings of a man who died in 122 B.C. Large iron castings have been found in China that were made as early as 900 A.D., and cast iron coins made about the first century B.C. In the opinion of one authority, a Dr. T. T. Read, these were made by using a high phosphorus coal. This has not been confirmed but at least puts in a bid to give China the nod as the nation first using coal commercially.

Now back to England who built an empire on her coal resources and from whom we derived our first methods of mining coal.

Early in the thirteenth century a grant was made to the monks of Newminster Abbey for some land on the Northumberland coast near Blyth, on the shore of the North Sea, in England. The grant also conceded a road to the "seashore with the right to recover seaweed and "secole." This "secole" or "sea coal" was of course coal eroded from its outcrop by the sea and deposited on the beaches. Sea Coal was the name used for the fuel for several centuries.

The monks of Tynemouth, a small community about seven miles south of Blyth, are given credit for the first mining of coal in England. No definite date is known, but in 1269 coal was being loaded onto sailing vessels for shipment. A statement of revenue drawn up in 1292 shows that the Tynemouth monks received the equivalent of $15 in our money a year for their labors. That was for the entire working force.

Smoke prevention raised its ugly head in London in the year 1257. Henry the Third had left his Queen Elinore in Nottingham while he journeyed into Wales. The good queen objected to the coal smoke, evidently from the kilns of some lime burners, and removed herself to a castle in a nearby town where wood faggots were still the fuel. In 1306 popular demand in London ruled that coal users go back to charcoal and stop polluting the air. This was only temporary, though, in the light of advancing civilization.

Early Mining

Mining at first, as might well be expected, took the form of just prying coal from an outcrop. These sources were soon worked out and the coal miner began going underground. The first deep mining of coal was done by the beehive method. No written records of this system are available, but secondary excavations made in recent years give us a good picture of

what happened. Small pits, about three ft in diameter, were sunk on about 12-ft centers to the coal. When the coal was reached the pit was widened out as far as it was safe to excavate the coal, generally not more than one to 1½ yd. When this bell-shaped chamber was completed, a new pit was started, the waste material being thrown into the previously mined-out pit. In 1354 there was recorded a transaction for two iron wedges and two coal picks and is the earliest known reference to coal mining tools. Explosives were not used in coal mining until about 1813 although their use in shaft sinking was recorded as early as 1719.

As the shallower coal seams were mined out, the pits had to be sunk deeper and deeper, and water became a problem. This was first solved by driving drainage tunnels to the outside wherever possible.

In 1486 it is recorded that a group of monks expended some money (about $48 in American money) on a water pump, the construction of a pump house and horses to work the pump at a mine. And in 1492, the year America was discovered, there was recorded a payment of forty shillings for "two iron chains for the ordinance of the mine at Whickham for drawing coals and water out of the coal pit there, by my Lord's command."

Pumps Developed

In 1698 a patent was granted for a fire engine to remove water from the mines. Thomas Savery gets credit for developing this, the earliest steam-engine to take a practical form and find employment in industry. It was a simple enough instrument. Picture a large globe with a pipe running from its top to a point of discharge and from the bottom to a sump, each pipe being equipped with a check valve. During the pumping cycle, steam was admitted to the vessel, forcing water out, through the check valve and up through the discharge pipe. When the vessel emptied of water, the supply of steam was stopped and the steam thus trapped was condensed by allowing a stream of cold water to flow over the outer surface of the vessel. The condensation formed a partial vacuum and allowed water from the sump to flow through the lower pipe and check valve filling the vessel which would be emptied by steam again on the next cycle. The pump had serious drawbacks, as can well be imagined, and it was not until Thomas Newcomen in 1705 developed an atmospheric engine and connected a walking beam to the piston that mine pumping as a field began to really grow. In 1715 a company was formed at London, England, to supply pumps to the mining industry. The business-like title of this company was "The Proprietors of the Invention for Raising Water by Fire."

Although there is no doubt that pumps would have been developed in time, it is commonly conceded that the dire need of the mining industry had a lot to do with the early developments of pumps and the steam-engine.

The atmospheric engines used for mine dewatering had to be large to do the work demanded for them. The largest one on record, used in North England, had a cylinder 72 in. in diameter and 10½ ft long. Foundry men of that era must indeed have had great skill to make such a large casting.

Then in 1769 James Watt filed his first patent on the steam-engine. He separated the condenser from the steam cylinder and made the forerunner of the huge steam engines of today. The way was now open for the rapid improvement of many jobs around the mines. And after Watt's patents expired George Stephenson, a colliery engineer, constructed the first successful steam locomotive in 1829.

Growth of Shaft Sinking

It is interesting to learn that the science of shaft sinking evidently grew more rapidly than the art of mining. Early in the eighteenth century shafts were being sunk to a depth of 400 ft; however, the average depth was less than half that according to authorities. In 1765 a depth of 600 ft was reached and a mine shaft was sunk to a depth of 774 ft in 1794. One would think that after sinking to such depths, that the mines would be extensive. But the late Howard N. Eavenson in his "Coal Through the Ages," remarks that, "In 1773 the 17 pits of South Birtley Colliery appeared to have worked only about 30 acres each."

It is impossible to give, in the course of one magazine article, full treatment to such a broad subject as the history of coal mining. However, in the belief that there are definite benefits to be gained from taking an occasional look at what has gone before, the accompanying article is presented. During the past seven centuries the industry has faced and solved many almost insurmountable problems. The coal miner of today can be proud indeed of that heritage.

The life of the early colliery worker was not an enviable one. In the first phase of deep mining, the miner hewed coal from the face with pick and wedge, loaded it into baskets, or "corves" as they were called, and transported them to the shaft bottom. However, as distances grew longer and the coal demand increased, the miner stayed at the face producing coal and young boys and even women were used to load and carry or drag the coal from the face to the pit bottom.

Women Underground

One observer of that time said that it was not uncommon to see women weeping most bitterly as they climbed out of the pits to dump the coal and singing in relief on their return trip. Ashton and Sykes in their "The Coal Industry of the Eighteenth Century" report that the basket in which coal was carried had a supporting strap that passed around the forehead. It would hold as much as 170 lb of coal and a woman might bear such a load a distance of 150 yd underground and then ascend with it 117 ft to the sur-

The pick had changed as had the miners' clothes but in 1919 almost 40 percent of the coal mined underground was still undercut by hand

face and finally carry it 20 yd further to a dump. This she might do as often as 24 times a day.

It was recorded by another observer in 1800 that boys entered underground workings at the age of seven or eight and sometimes as early as six. They had to work 12 to 18 hours a day while the finished collier worked eight or ten hours.

Mining communities were isolated at that time in England and communication was poor. It was not until 1808 that severe public criticism was made of the punishment endured by women and children in the mines. The English Government appointed a commission to collect facts on the situation and outline reforms that should be made. Their report was not published until 1842. A search of the newspapers of that time reveals that the British public was appalled at the revelation. The impression is that the English people could not believe that such things were going on in their country. The report must have had great effect since a law was passed called Lord Ashley's Act in honor of the man who was the driving force behind its passage, taking effect March 1, 1843, under which all women and girls were excluded from underground work as well as boys under ten years of age. Where it took 34 years for the report to be completed, it took less than one year after the report's publication to pass a law eliminating the evil.

The Scottish miners had earlier, in 1837, taken the necessary steps to exclude all women from mines; however, it is reported that many women reentered the mines, even going so far as to disguise themselves by donning male clothing. Employment of women underground was voluntarily discontinued in several mining areas of England before 1800, but in other areas was continued until the passage of Lord Ashley's Act in 1843.

As the pits began to go deeper, ladders were replaced, of course, by winches and hoists. The coal miner was paid by the number of baskets or "corves" produced, and a man at the top of the shaft kept track of them as they came to the surface and saw that they were properly filled. That there was some need for this may be gathered from the following statement taken from "The Complete Collier" written by an author whose initials, F. C., only are known and published in 1708. According to F. C.: "Or both the hewers and barrow-men will confederate underground, and they will be sometimes so roguish as to set those big coals so hollow at the corfe bottom and cover them with some small coals at the top of the corves." We wonder what form the "roquishness of today's miner takes.

Coal was now being mined by the bord and pillar method generally. Entries were driven on the butts of the coal and bords or stalls were cut off these at intervals. Bords were then driven about three yd wide with intervening pillars about four yd thick. This meant that less than half the coal was mined. The principle of pillar robbing entered the picture and gradually grew until in 1753 an English coal mine was completely mined out and in 1765 a village street subsided because of mined-out coal.

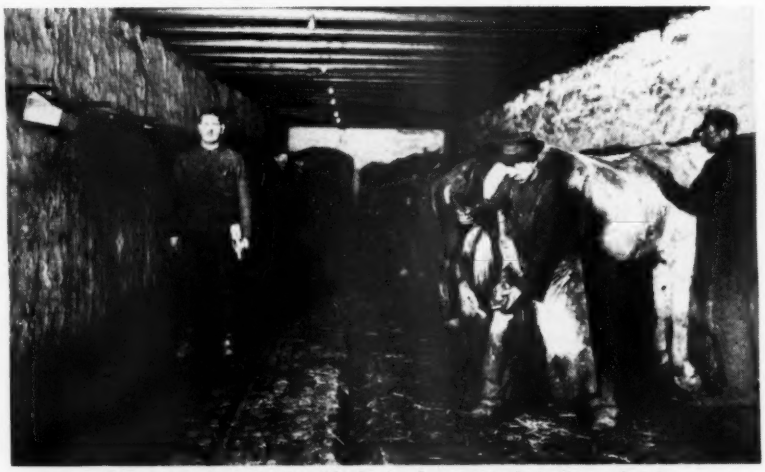
In the late eighteenth century a Thomas Barnes came upon the coal mining scene and developed the room and pillar system of mining much as we know it today.

Early Ventilation

Ventilation in the earliest coal mines was non-existent. One method of eliminating firedamp or methane in a coal mine described by Ashley and Sykes is of interest. The fire boss of that time, after discovering an accumulation of methane, would light a candle in a safe place, place it on a board or shingle to which was attached a string and then go off down the entry or room to the other side of the gas accumulation. There he would lay down in a hole cut in the bottom for this purpose and cover himself with pieces of board and whatever else was handy. He would then draw the shingle bearing the lighted candle toward him by means of the string and when the gas was ignited he was theoretically protected from the effects. There can be no denying that miners always have been, are now and probably ever will be an extremely hardy lot.

It is a fact that many of the mines of that day escaped explosion because ventilation was so lacking that there was not enough air to dilute the firedamp to the point where it would ignite. Early attempts at mine ventilation were many and varied. In places, branches of foliage were tied in bundles and rapidly raised and lowered in the shaft to move air into nearby workings. Bellows operated by manpower were used. If a mine had two openings, natural ventilation was used, in certain cases chimneys being built over an air shaft to create stronger drafts of air. Large cones built to deflect natural air currents into the mine were not unknown and even falling water was used to induce ventilation. The latter proved unsatisfactory on account of trouble in getting rid of the water. Then lamps were hung in air shafts, heating the air and causing a slow circulation. This was followed by small grates and later well built furnaces at the bottom of upcast shafts.

Furnace ventilated mines were not necessarily poorly ventilated mines. One colliery in northern England so far developed their furnaces as to move 190,000 cfm of fresh air into the mine. Another method which compared quite favorably with the furnace was the steam jet. This took the form of simply piping steam from the surface to the bottom of a shaft, where it was allowed to escape, rising up the shaft and inducing a current of air through the mine.



An early underground stable for haulage animals in Pennsylvania

About 1807 to 1810 a steam-driven piston air pump was contrived for mine ventilation. It was simply a square box for a pump chamber with a wooden piston five ft square and having an eight-ft stroke. With a speed of 20 strokes per minute, this machine had a theoretical capacity of 8000 cfm. Actual performance, however, would have been much lower. Not until about 1850 did mechanical ventilation with centrifugal fans became predominant and from that time down to the present, improvements have constantly been made.

Transportation Growth

As we have read, the first form of coal transportation underground was

The breast machine was one in a long line of cutting machines that has culminated in the efficient machines of today

the carrying of coal in baskets or sacks on the backs of young boys or women. Later came sledges upon which the coal baskets were placed and then pushed and pulled to the shaft bottoms. It is not known when the wheel was introduced underground, but as early as 1610 mine track was used. First tracks were two parallel lines of planks. A pin projecting from the bottom of the wagon and into the space between the two "tracks" kept the wheels on the planks. In 1667 it is recorded that horses were used underground for haulage. Cast-iron rails, having a flange to keep the wheels in position, were first used about 1753 and wrought-iron rails were substituted for the cast ones about 1780. These took the form of straps fastened to timbers. The predecessor to our present day mine cars, wheeled wagons which could be moved from the face to the shaft bottom and then raised up the shaft without changing the contents were first used about 1787.

Coal in America

It is impossible to say who found or used coal first on the North American continent. However, the first written reference to coal being found here was made in an article published in Paris in 1672 and refers to coal deposits on Cape Barton. In the United States, it was recorded that a Jesuit missionary saw Indians making fire with coal as early as 1660. Joliet and Marquette made reference to coal in 1673 and a map published by Joliet in 1674 shows the presence of coal near the present city of Utica, Ill. By 1701, coal was found near Richmond, Va., and coal was being shipped from there to New York and the West Indies as early as 1758. In 1742, the first known record of coal in southern West Virginia was made by a group of men who were exploring the country west of the mountains.

Reference is made to coal in western Pennsylvania on an undated manuscript map published before 1753. The first authenticated date for the discovery of anthracite is 1762 when a company of pioneers found some near the present city of Wilkes-Barre, Pa. Coal was discovered in Alabama in 1834 and on July 7, 1854, the Westmoreland Coal Co. was chartered, making it the oldest bituminous coal mining company in the United States.

Mechanization Progress

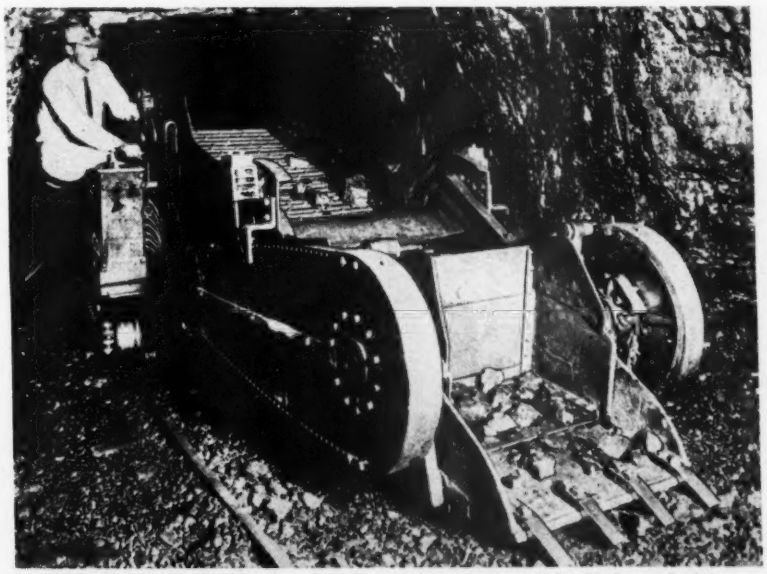
Coal production rapidly rose until in 1890, according to the U. S. Bureau of Mines, 111,302,322 tons of coal were produced. Most of this coal was produced by hand work. It wasn't until the 1880's that coal cutting machines were used, the first being puncher-type coal-cutting machines driven by compressed air. What is believed to be the first electric coal-cutter in the world was reportedly manufactured in 1889 and installed in an Illinois mine. About 1910, the first short-wall cutting machine, the predecessor of the types that are universally used today, was developed. The first electric locomotive is said to have replaced 12 mules and was installed in an Illinois coal mine about 1890.

Attempts at mechanical loading go back to 1888, when a tunnel-driving machine, the Stanley Heady, was brought to the United States from England and tried in a coal mine near Colorado Springs, Colo. Coal was loaded by hand behind the machine. The first Stanley Heady with conveyor was tried in 1890 at a mine in Lebanon, Ill.

The Pike County Coal Corp. in 1920 made the first Indiana wage agreement covering mechanical loading, and in 1922 the first all mechanical mine was opened by David Ingle at Ayrshire, Ind. The same year the Shamokin mine of the Pocahontas Fuel Co. was placed on a full mechanical basis.

At the first annual convention of practical operating men, held under the auspices of the American Mining Congress on May 12, 1924, a statement was made at the meeting that there were 263 loading machines in operation then. In 1927 the first state wage agreement covering mechanical loading was signed in Illinois followed shortly by a state-wage agreement in Indiana. In 1929 a mechanization census taken by the national committee on mechanized mining of the American Mining Congress showed that 40 mines, with a combined daily capacity of 50,000 tons, were on a 100 percent mechanized basis and had eliminated all hand loading.

With the advent of mechanization, the coal industry passed from one era into another. Changes made in the past 30 years certainly outstrip those made in the previous seven centuries. If the progress recorded by history is any gauge of the future, as it certainly must be, coal can look forward to almost unlimited horizons.

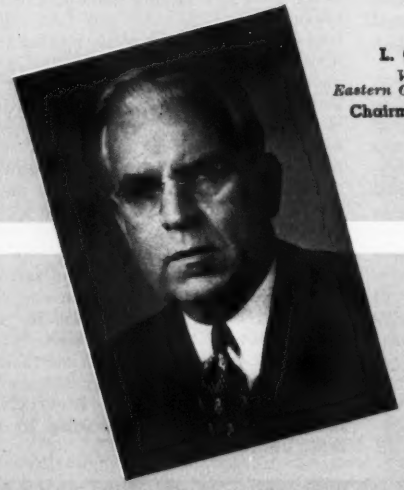


In 1908 Myers-Whaley introduced the first modern mechanical loader for coal mining

EDWARD G. FOX
President
The Philadelphia & Reading Coal & Iron Co.
Chairman, Program Committee

Coal Convention

American Mining Congress to Meet in Queen City



L. C. CAMPBELL
Vice-President
Eastern Gas & Fuel Associates
Chairman, Coal Division

RALPH K. GOTTSHALL
President
Atlas Powder Co.
Chairman, Manufacturers Division

FROM May 3 to 5, Cincinnati, Ohio, will be host to mining men from all over the country. The big attraction will be the American Mining Congress' 1954 Coal Convention. At this meeting topics of major importance to the industry will be discussed by leading authorities from the coal industry and from other businesses and by prominent Government officials. Coal powers the nation, and its problems are of deep concern to legislator, miner and businessman alike.

Interest in the meeting is not limited to those closely associated with coal mining. Men from other segments of the mineral industry will be on hand to learn how coal has benefited from its mechanization program over the years. Each year more metal and nonmetallic mining men are finding that they can learn a great deal from the coal industry. Only interested observers at first, they are taking an active part in this year's program.

Fine Program Set

The Program Committee, headed by Chairman Edward G. Fox, president, The Philadelphia & Reading Coal & Iron Co., has done an outstanding job in providing speakers and

topics of up-to-the-minute interest to the entire industry. Special effort has been made to arrange a program that is balanced geographically as well as giving thorough coverage to the industry's most important problems today. Truly, there will be something of vital importance for everyone.

These Mining Congress meetings have traditionally been the place where new developments in the industry are first announced. This year is no different and at least two new mining machines will be described in open forum for the first time. Other speakers will tell exactly how dollars are being saved through more efficient use of traditional equipment. Efficiency of large versus small mechanical mining crews will be discussed, as will the effects of future markets on coal preparation. Strip mining, maintenance and power, roof support —each of these phases of coal mining will be dealt with by recognized experts.

JULIAN D. CONOVER
Executive Vice President and Secretary
American Mining Congress

HOWARD I. YOUNG
President
American Zinc, Lead & Smelting Co.
President, American Mining Congress

A study of the final program in these pages will enable you who are going to be in Cincinnati for the meeting to plan your time to best advantage. In addition to the ten technical sessions, there will be two business luncheons. The one on Monday will feature as guest speaker a prominent official from the Department of Defense. At the luncheon on Tuesday, Walker L. Cisler, president of The Detroit Edison Co., will talk on atomic energy and its industrial applications. Surely no one will want to miss either of these timely and authoritative talks.

WALKER L. CISLER
President
The Detroit Edison Co.
Mr. Cisler will address the Tuesday luncheon

Entertainment

In addition to the luncheons and the business meetings throughout each day, an outstanding entertainment program has been arranged. Those who attended the 1952 AMC Coal Convention in Cincinnati will remember the fine time they had at the Coal Miners Party on Monday evening. This year it will again be held at Coney Island, Cincinnati's world-famous amusement park which needs no introduction to Mining Congress visitors. A delicious buffet supper in the Moonlight Gardens will follow the "warm-up" reception on the terrace overlooking Lake Como. After supper, music, dancing and an excellent floor show will make the evening seem all too short. Special arrangements have been made to have some of the park's unusual rides and other attractions open without charge to those who attend the Coal Miners Party.

Another traditional fixture of the Cincinnati meeting is Baseball Night. Once again the mining men and their ladies will troop out to the ball park to take their places in the "Mining Congress Section" of the grand-

Members—Program Committee

R. Laird Auchmuty
Consulting Engineer

Henry Barnhart
Baldwin-Lima-Hamilton Corp.

J. W. Broadway
Bell & Zoller Coal Co.

Birch Brooks
Viking Coal Corp.

E. G. Brown
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Old Ben Coal Corp.

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Northwestern Improvement Co.

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Anaconda Wire & Cable Co.

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Consulting Engineer

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Red Jacket Coal Corp.

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Chester Sensenich
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Frank G. Smith
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Miners Coal Co.

J. B. Taggart
Wise Coal & Coke Co.

J. F. Trotter
Trotter Coal Co.

C. W. Waterman, Jr.
McNally-Pittsburg Mfg. Corp.

W. L. Wearly
Joy Mfg. Co.

stand to root for the Cincinnati Reds or the New York Giants. It promises to be a real contest from start to finish, no matter who wins.

To make sure of getting seats with friends, applications for tickets should be sent promptly direct to the Cincinnati Baseball Club, 307 Vine St., Cincinnati, Ohio. Be sure to ask for seats in the Mining Congress Section.

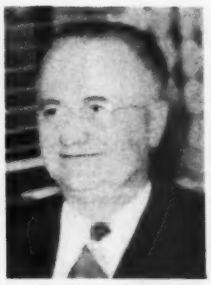
For entertainment at the biennial Coal Convention banquet, a musical program has been arranged that will live long in the memory of each of those who attends. The Varsity Glee Club of Purdue University has selected from its repertoire of popular and semi-classical songs, which has made it famous throughout America and Europe, a program of special favorites. Cincinnati's "singing vision of television," Marian Spelman, and Arthur Lee Simpkins, whose remarkable tenor voice has delighted audiences from coast to coast

James D. Reilly
Hanna Coal Co.
Chairman
Floor Committee

(Continued on page 50)

Session Chairmen

C. R. Bourland
The New River Co.



J. W. Broadway
Bell & Zoller Coal Co.

A. G. Gossard
Snow Hill Coal Corp.

R. E. Kirk
Tenn. Coal & Iron Div.
U. S. Steel Corp.

H. C. Livingston
Truax-Traer Coal Co.

Edwin Phelps
Pittsburg & Midway Coal Mining Co.

G. A. Shoemaker
Pittsburgh Consolidation Coal Co.

G. R. Watkins
U. S. Fuel Co. (Utah)

H. B. Wickey
Lehigh Valley Coal Co.

The Convention program contains something of vital importance to all mining men


Eugene Ayres


Edward Steidle


Edwin R. Price


Charles R. Ferguson


Troy L. Back


John S. Forsythe


J. K. Berry


Martin Valeri

Convention PROGRAM


M. M. Fitzwater


C. S. Kuebler


George L. Judy


J. A. Younkins

Monday—May 3

9:30 A. M.—PRE-SESSION MOTION PICTURE

"Oklahoma and Its Natural Resources."

10:00 A. M.—OPENING SESSION

Opening of Convention: JULIAN D. CONOVER, Executive Vice-President, American Mining Congress.

Chairman: EDWARD G. FOX, Pres., Philadelphia & Reading Coal & Iron Co.

What's Ahead for Coal?

EUGENE AYRES, Technical Asst., to Vice-Pres., Gulf Research & Development Co.

The Federal Coal Mine Safety Board of Review—

A panel discussion

EDWARD STEIDLE, Chairman; Dean Emeritus, Pennsylvania State University.

EDWIN R. PRICE, Board Member; Mgr., Coal Properties (Retired), Inland Steel Co.

CHARLES R. FERGUSON, Board Member; Dir., Safety Div., United Mine Workers.

TROY L. BACK, Executive Secretary.

JOHN S. FORSYTHE, General Counsel.

12:15 P. M.—LUNCHEON

Presiding: L. C. CAMPBELL, Vice-Pres., Eastern Gas & Fuel Associates; Chairman, Coal Division, American Mining Congress.

Address: A top ranking official of the Department of Defense will discuss coal's place in our national defense.

1:45 P. M.—PRE-SESSION MOTION PICTURE

"The Drama of Portland Cement."

2:15 P. M.—ROOF SUPPORT SESSION

Chairman: J. W. BROADWAY, Vice-Pres., Bell & Zoller Coal Co.

Rotary Drilling in Sand Rock for Roof Bolting

J. K. BERRY, Production Engr., Clinchfield Coal Corp.

Pneumatic Drilling for Roof Bolting

MARTIN VALERI, Asst. to Gen. Supt., and M. M. FITZWATER, Mining Eng., Buckeye Coal Co.

Yielding Steel Ring Support of Squeezing Coal Tunnel

C. S. KUEBLER, Asst. Mng. Engr., Lehigh Navigation Coal Co.

Pillar Extraction—Methods, Results, Recovery

GEORGE L. JUDY, Vice-Pres., Consolidation Coal Co. (W. Va.)

J. A. YOUNKINS, Asst. Gen. Supt., Duquesne Light Co.


Andrew Hyslop


Kenneth O. Shaner


D. A. Zegeer


John W. Davies


D. C. Howe


Robert Yourston


F. F. Stewart


Henry W. Bauer


Joe Craggs


G. S. Jenkins


J. B. Morrow


I. V. Curtis

1:45 P. M.—PRE-SESSION MOTION PICTURE

"225,000 Mile Proving Ground."

2:15 P. M.—STRIP MINING SESSION

Chairman: H. C. Livingston, Vice-Pres., Truax-Traer Coal Co.

Truck Haulage Problems—Engines, Tires, Roads

Andrew Hyslop, Chief Engr., Hanna Coal Co.

The Coal Recovery Auger—A Modern Mining Tool

In Western Pennsylvania:
Kenneth O. Shaner, Asst. to Vice-Pres., Mech Mining Co.

In Eastern Kentucky:
D. A. Zegeer, Asst. to Pres., Consolidation Coal Co. (Ky.).

Anthracite Stripping in Burning Areas

John W. Davies, Blasting Engr., Shen-Penn Production Co.

MONDAY EVENING—COAL MINERS PARTY

Dinner, entertainment, music and dancing at Coney Island, Cincinnati's famous amusement park.

Tuesday—May 4

9:30 A. M.—PRE-SESSION MOTION PICTURE

"The Big Vacation"—A Travelogue.

10:00 A. M.—MECHANICAL MINING SESSION

Chairman: H. B. Wickey, Vice-Pres., Lehigh Valley Coal Co.

Face Preparation Methods

In Level Seams:
D. C. Howe, Mines Industrial Engr., Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp.

In Pitching Seams:
Robert Yourston, Resident Engr., Union Pacific Coal Co.

Complete Mechanization in a Five-Ft Seam

F. F. Stewart, Supt., Jewell Ridge Coal Corp.

Efficiency of Large vs. Small Crews for Mechanical Mining—A Symposium

Henry W. Bauer, Div. Mgr., West Virginia Coal & Coke Corp.

Joe Craggs, Field Supt., Operations, Peabody Coal Co.

G. S. Jenkins, Pres., Clarkson Manufacturing Co.

9:30 A. M.—PRE-SESSION MOTION PICTURE

"Viva Mexico"—A Travelogue.

10:00 A. M.—COAL PREPARATION SESSION

Chairman: G. R. Watkins, Gen. Mgr., United States Fuel Co.

Effect of Future Markets on Coal Preparation

J. B. Morrow, Consulting Mng. Engr., Alford, Morrow & Associates.

Sludge Recovery at Midwest Radiant Co.

I. V. Curtis, Chief Elec., Midwest Radiant Co.

(Continued next page)


A. E. Sadler


J. W. Forman


D. C. Snyder


H. F. Yancey


R. U. Jackson


T. C. Harris, Jr.


C. H. Williams


W. J. Shields


Thomas M. Ware


Jules E. Jenkins


R. H. Uhl


Donald Smith

Heavy Media Coal Cleaning

In the Pocahontas Field:
A. E. SADLER, Asst. Chief Engr., and J. W. FORMAN, Preparation Engr., Pocahontas Fuel Co.
In the Sewell Field:
D. C. SNYDER, Vice-Pres., Mt. Hope Coal Co.

Development in Feldspar Jigging

H. F. YANCEY, Chief, Fuels-Technology Div., Region II, U. S. Bureau of Mines.

12:15 P. M.—LUNCHEON

Presiding: RALPH K. GOTTSHALL, President, Atlas Powder Co.; Chairman, Manufacturers Division, American Mining Congress.

Address—**"Atomic Energy and Its Industrial Applications"**

WALKER L. CISLER, Pres., The Detroit Edison Co.

1:45 P. M.—PRE-SESSION MOTION PICTURE

"Pacific Islands of World War II"—A Travelogue.

2:15 P. M.—HAULAGE SESSION

Chairman: C. R. BOURLAND, Vice-Pres., New River Co.

Underground Belt Conveyor Maintenance

R. U. JACKSON, Mgr., Mine Conveyor Sales, Hewitt-Robins Incorporated.

Shuttle Car Haulage to Mine Cars

T. C. HARRIS, JR., Asst. Engr., Ingle Coal Corp.

Shuttle Car Belt Loading in Thin Seams

C. H. WILLIAMS, Chief Engr., Red Jacket Coal Corp.

Extensible Belt Conveyor for Continuous Mining

W. J. SHIELDS, Chief Mng. Engr., Rochester & Pittsburgh Coal Co.

1:45 P. M.—PRE-SESSION MOTION PICTURE

"A Close-up of Steel Production"

2:15 P. M.—STRIP MINING SESSION

Chairman: EDWIN R. PHELPS, Vice-Pres., Pittsburg & Midway Coal Mining Co.

Bigger Returns from Larger Stripping Equipment

THOMAS M. WARE, Vice-Pres., Engineering Div., International Minerals & Chemical Corp.

Recent Information on Blasting Vibrations

JULES E. JENKINS, Vibration Measurement Engineers.

Strip Mine Haulage Roads

R. H. UHL, Mng. Engr., W. G. Duncan Coal Co.

TUESDAY EVENING—BASEBALL NIGHT

Wednesday—May 5

9:30 A. M.—PRE-SESSION MOTION PICTURE

"Defense of Industry."

10:00 A. M.—MAINTENANCE AND POWER SESSION

Chairman: A. G. GOSSARD, Vice-Pres., Snow Hill Coal Corp.

Maintenance Organization and Practices at Hudson Coal Co.

DONALD SMITH, Supt. of Shops, Hudson Coal Co.


John A. Dunn


T. R. Weichel


Gerald von Stroh


W. A. Weimer


T. W. Guy


R. A. Mullins


Henry F. Hebley


J. W. MacDonald


E. M. Pace


Richard Graham


R. C. Beerbower, Jr.


C. B. Tillison, Jr.


F. R. Zachar


W. D. Hawley


John S. Todhunter

Underground Installation of High Voltage Cables

JOHN A. DUNN, Elec. Engr., Island Creek Coal Co.
T. R. WEICHEL, Mine Elec. Engr., Hazard Insulated Wire Works Division of the Okonite Co.

Mine Illumination—The BCR Experiments

GERALD VON STROH, Dir., Mining Development Committee, Bituminous Coal Research, Inc.

9:30 A. M.—PRE-SESSION MOTION PICTURE

"Williamsburg, Virginia."

10:00 A. M.—COAL PREPARATION SESSION

Chairman: RALPH E. KIRK, Mgr. of Raw Materials, Tennessee Coal & Iron Div., U.S. Steel Corp.

Reject Disposal by Pump and Pipeline

W. A. WEIMER, Chief Engr., Northern Illinois Coal Corp.

Reject Handling in the Appalachian Field

T. W. GUY, Consulting Engr., Charleston, W. Va.

Coal Recovery by Reduction of Washery Wastes

R. A. MULLINS, Chief Chemist, Ayrshire Collieries Corp.

Developments in Eliminating Stream Pollution

HENRY F. HEBLEY, Research Consultant, Pittsburgh Consolidation Coal Co.

1:30 P. M.—PRE-SESSION MOTION PICTURE

A Travelogue.

2:00 P. M.—CONTINUOUS MINING SESSION

Chairman: G. A. SHOEMAKER, Exec. Vice-Pres., Pittsburgh Consolidation Coal Co.

Continuous Mining Operations—A Symposium

Goodman Miner:
J. W. MACDONALD, Vice-Pres., Old Ben Coal Corp.

Jeffrey Colmol:
E. M. PACE, Mine Supt., Inland Steel Co.

Joy Continuous Miner:
RICHARD GRAHAM, Supt., Saginaw Dock & Terminal Co.

Konnerth Miner:
R. C. BEERBOWER, JR., Mine Supt., Coal Div., U. S. Steel Corp.

Lee-Norse Miner:
C. B. TILLSON, JR., Supt., Crucible Steel Co. of America.

Marietta Miner:
F. R. ZACHAR, Gen. Supt., Christopher Coal Co.

Two Years' Experience in Longface Mining

The Coal Plow:
W. D. HAWLEY, Div. Mgr., Eastern Gas & Fuel Associates.

The Sampson Stripper:
JOHN S. TODHUNTER, Mng. Engr., Barnes & Tucker Co.

7:00 P. M.—ANNUAL BANQUET

Presiding: EDWARD G. FOX, Pres., Philadelphia & Reading Coal & Iron Co.; National Chairman, Program Committee.

No speeches—Outstanding musical program.

Manufacturers Division

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R. K. GOTTSHALL
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*Hulburt Oil & Grease Co.
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International Nickel Co., Inc.
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Long Co., The
Longyear Co., E. J.
Ludlow-Saylor Wire Cloth Co.
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Marion Power Shovel Co.
Mechanization, Inc.
*Mine Safety Appliances Co.
Mine & Smelter Supply Co.
Mining Machine Parts, Inc.
Mosebach Electric & Supply Co.
Mott Core Drilling Co.
Murphy Diesel Co.
*Myers-Whaley Co., Inc.

Nachod & United States Signal Co.
National Electric Coil Co.
National Malleable & Steel Castings Co.
National Mine Service Co.
Nolan Co.
Nordberg Mfg. Co.
Northwest Engineering Co.

*Ohio Brass Co.
Ohio Carbon Co.
Okonite Co.
Hazard Insulated Wire Works Division
Olin Industries, Inc.
Western Cartridge Division
Oliver Iron & Steel Corp.
Oliver United Filters, Inc.
Osmose Wood Preserving Co.

Page Engineering Co.
Paris Mfg. Co.
Pattin Mfg. Co.
Penn Machine Co.
Peterson Filters & Engineering Co.
*Phillips Mine & Mill Supply Co.
Pioneer Engineering Works, Inc.
Pittsburgh Gear Co.
Pittsburgh Screw & Bolt Corp.
Post-Glover Electric Co.
Productive Equipment Corp.
Prox Co., Inc., Frank

Quaker Rubber Corp.

Raybestos-Manhattan, Inc.
Reich Bros. Mfg. Co.
Reliance Electric & Engineering Co.
Republic Rubber Division
Lee Rubber & Tire Corp.
*Roberts & Schaefer Co.
*Roebling's Sons Corp., John A.
Rome Cable Corp.
*S K F Industries, Inc.
Safety First Supply Co.
Salem Tool Co.
Schroeder Brothers
Sheffield Steel Corp.
*Simplex Wire & Cable Co.
Simplicity Engineering Co.
Southwestern Engineering Co.
Sprague & Henwood, Inc.
Stearns-Roger Mfg. Co.
Sterling Steel Casting Co.
Sun Oil Co.

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Tamping Bag Co.
Texas Co.
Thor Power Tool Co.
Tide Water Associated Oil Co.
*Timken Roller Bearing Co.
Tool Steel Gear & Pinion Co.
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Traylor Engineering & Mfg. Co.
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Ultra Violet Products, Inc.
Union Iron Works
Union Wire Rope Corp.
*United Engineers & Constructors, Inc.
U. S. Rubber Co.
Mechanical Goods Division
Electrical Wire & Cable Dept.
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Varel Mfg. Co.
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Victaulic Co. of America
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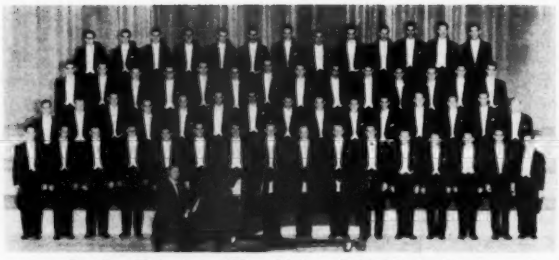
*Weir Kilby Corp.
Western Machinery Co.
Western Precipitation Corp.
Western Rock Bit Mfg. Co.
*Westinghouse Electric Corp.
West Virginia Steel & Mfg. Co.
White Motor Co.
Winter Weiss Co.

Entertainment

Specialty Acts for Coal Miners' Party

Arthur Lee Simpkins, Marian Spelman and . . .



. . . Purdue University Glee Club will highlight the Annual Banquet

(Continued from page 43)

and in the capitals of the Continent, will be the soloists of the evening.

As usual, the dinner will be informal. There will be no speeches—only brief introductions of the honor guests.

For the Ladies

Ladies are urged to come to Cincinnati for the meeting. They are, of course, cordially invited to all the convention entertainment described above and in addition a special program of three daytime events has been arranged for their enjoyment. On Monday there will be a "get-acquainted" luncheon at the Sheraton-Gibson Hotel. "Mr. Mystery," the mental wizard, will be the feature attraction.

On Tuesday, they can rest and relax on a four-hour boat trip on the beautiful Ohio. A delicious buffet luncheon will be served on board. No need to worry about how to get down to the wharf, either—there will be special bus service from the Netherland Plaza Hotel direct to the boat.

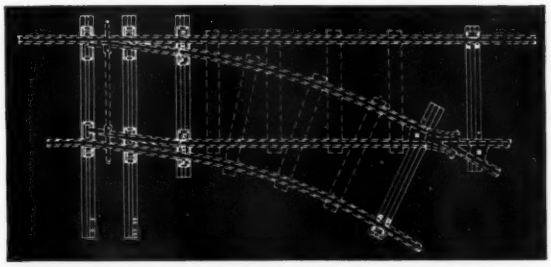
In the Netherland Plaza's Hall of Mirrors, on Wednesday at noon, there will be a special luncheon and fashion show featuring "what's new for summer," which none of the ladies will want to miss.

There will be food, fun and frolic at Coney Island on Monday night

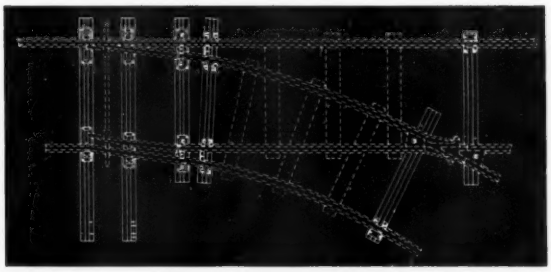
Ladies' headquarters will be in the Julep Room on the third floor of the Netherland Plaza. Someone familiar with all Cincinnati's points of interest and the best places to shop will be there at all times to assist the visitors.

Lay Room Turnouts

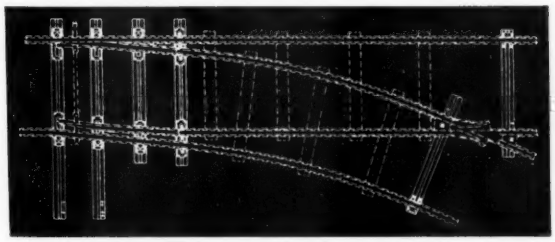
in ¼ the Usual Time!



TURNOUT TIE SET "E" with Bolted-Frog Ties*—may be used for turnouts having 3-ft 6-in. or 4-ft switches.
Includes 2 long ties for switch stand, 1 tie under switch heel, 2 frog ties.



TURNOUT TIE SET "F" with Bolted-Frog Ties*—recommended for turnouts having 3-ft 6-in. or 4-ft switches.
Includes 2 long ties for switch stand, 1 tie under switch heel, 1 tie beyond switch heel, 2 frog ties.



TURNOUT TIE SET "G" with Bolted-Frog Ties*—may be used for turnouts having 5-ft or 6-ft switches.
Includes 2 long ties for switch stand, 1 intermediate tie, 1 tie under switch heel, 2 frog ties.

Take a trip through any modern mine, and chances are you'll be surprised at the number of steel tie sets in use. The reason is easy to understand. More and more mine operators are finding that Bethlehem turnout tie sets are far more economical than their wooden predecessors.

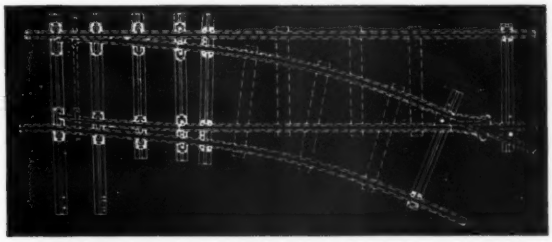
For example, room turnouts laid on steel tie sets eliminate the need for many rail braces and slide plates. They're easy and quick to install, too—any two miners can lay turnouts in about one-quarter the time they'd need to install the same turnout on wood ties. In fact, an hour is plenty of time for two men to lay a complete turnout on a Bethlehem turnout tie set.

All Bethlehem Turnout Tie Sets are of riveted-and-welded construction, with two of the ties made long enough to accommodate a parallel-throw switch stand. The drawings show four popular Bethlehem tie sets, one of which is sure to meet the needs of your particular system. We'll be glad to help you select the set best suited to your layout. Just write or phone the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

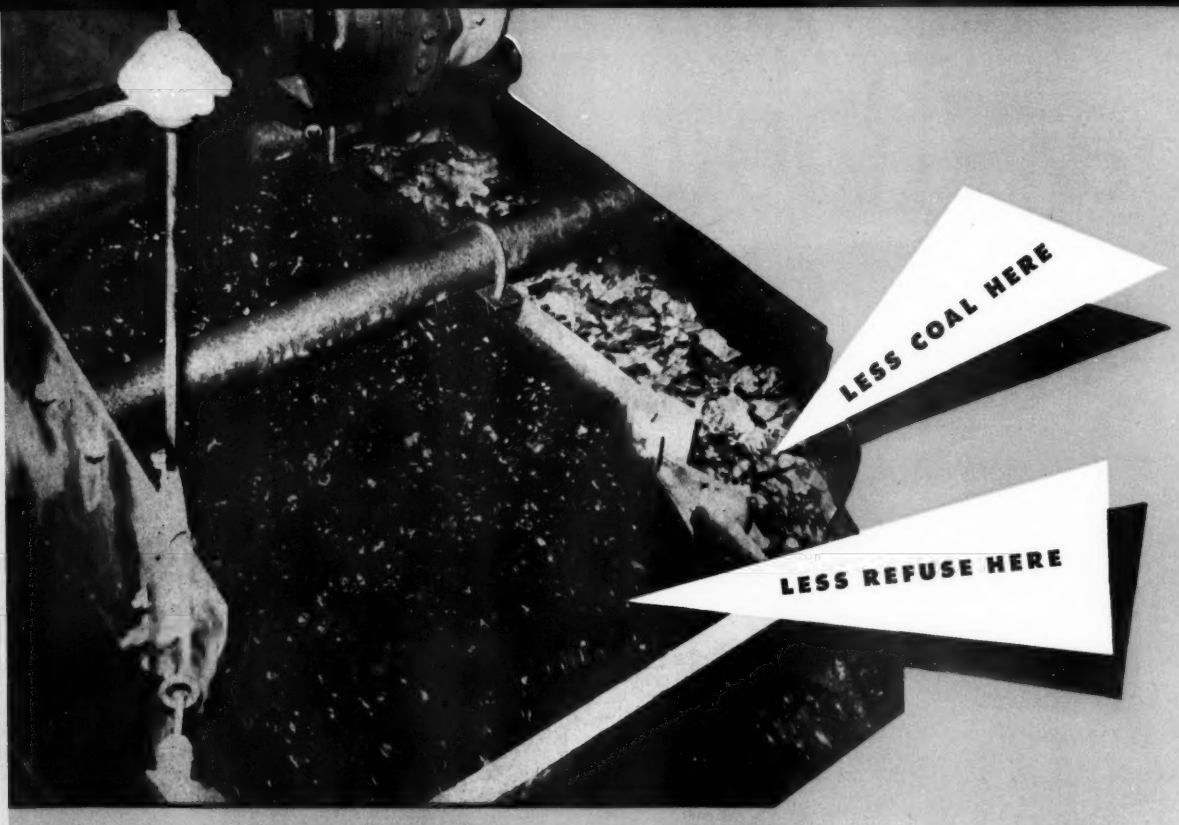
BETHLEHEM STEEL



TURNOUT TIE SET "H" with Bolted-Frog Ties*—recommended for turnouts having 5-ft or 6-ft switches.
Includes 2 long ties for switch stand, 1 intermediate tie, 1 tie under switch heel, 1 tie beyond switch heel, 2 frog ties.

***Riveted instead of Bolted-Frog Ties may be specified.**

Bethlehem Turnout Tie Sets



Hard to believe - but true!

Heavy-Media Separation can add as much as $40,000 A YEAR EXTRA PROFIT on every 100 t.p.h. cleaned

FACT

Time and again, in comparative tests, Heavy-Media Separation recovers 2½ to 5% more low-ash coal from the same total-seam r.o.m. feed, i.e. 2½ to 5 tons more from every 100 t.p.h. cleaned.

FACT

Every ton lost to refuse costs you your out-of-pocket mining and tipple costs *plus* the income you would have had by shipping it. Conservatively, at today's costs and selling prices, just one ton an hour less coal in your refuse will add $20,000 a year to profit.*

**Based on 190 days, two shifts.*

AMERICAN Cyanamid COMPANY

FACT

Over 1000 t.p.h. Heavy-Media Separation capacity operates solely on jig middlings, refuse and dumps. These plants operate commercially on what other methods lose to refuse!

FACT

No matter how your raw-feed fluctuates in tonnage, size-consist or percent of near-gravity material, Heavy-Media Separation can closely duplicate heavy-liquid washability results.

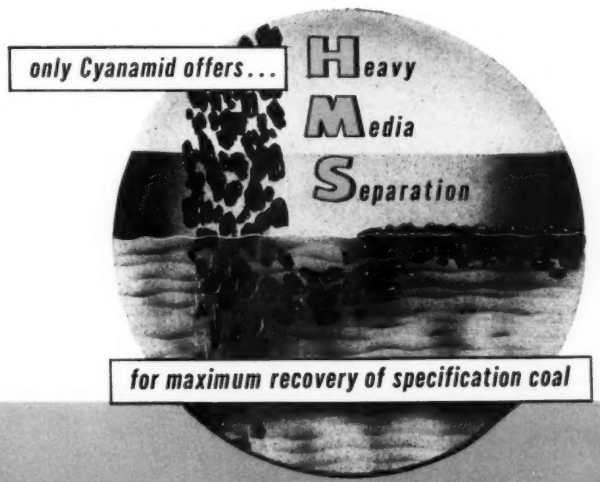
WHAT YOU SHOULD DO NOW

If you have a cleaning plant

Run heavy-liquid tests on your coal and refuse. Tell us shipping specifications you must meet or would like to meet. Ask us to estimate the cost and net profit on an H.M.S. Unit to supplement your present cleaners. It might be the best investment you ever made!

If you are considering a new plant

Talk things over with a Cyanamid Field Engineer. Let him give you unbiased data on what Heavy-Media Separation can do on your coal, what your capital and operating costs are likely to be. Get all the facts *first-hand* before you decide. A letter or phone call will get action.



MINERAL DRESSING DEPARTMENT 30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

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in the softer rock formations

The new CP-555's short over-all length permits set-up in restricted quarters.

Now, for the first time, you can have a fast and powerful rotary drill with an entirely independent rotary motor feed that affords full control at all times. And it's all combined in one compact machine – the new CP-555 Rotauger. Available for dry or wet drilling, it drills 2½ inch holes in speeds of 2 to 4 feet per minute in depths to 100 feet or more in gypsum, talc, medium limestones and other softer formations. For more information write for Bulletin SP-3110.

Chicago Pneumatic Tool Company, 8 East 44th St., New York 17, N. Y.

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PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Like most other businesses mining requires an increasing number of specialists

The Shortage of Young Engineers And What To Do About It

The Present Situation

By BYRON E. GRANT

Some Plain Talk on a Vital Subject Presented By:

Byron E. Grant
Assistant to Vice-President and General Manager of Western Operations, U. S. Smelting, Refining and Mining Co.

Charles E. Schwab
Mining Engineer
Bunker Hill & Sullivan Mining & Concentrating Co.

Dr. J. Robert Van Pelt
Head, Montana School of Mines

Richard A. Young
Vice-President
American Zinc Lead and Smelting Co.

THE National Manpower Council, in a report entitled "A Policy for Scientific and Professional Manpower" said: "This Nation's economic and social well-being and its continued progress depend to a striking degree upon a small group of men and women who work in scientific and professional fields." Since 1900 the number of men and women in this group has been growing almost twice as fast as our total population. Today there is one engineer for every 120 persons in the nation's working force. Eighty years ago the ratio was only one for every 2000. About 80 percent of those employed as engineers are employed in private industry.

Trend Is Upward

There were about 5000 engineering graduates in 1920, an average of 7000 per year during the twenties, and 11,000 graduates per year for the decade ending in 1939. During the forties, in spite of the war, the average was 19,000 engineering graduates per year and in 1950 the graduating class rose to about 52,000. Since then it has fallen to 40,000 in 1951 and 30,000 in 1952. The outlook is a reduction to 20,000 graduates for the year 1954, but the long-term outlook is upward.

How, with this rapid increase in the number of engineers and the trend toward a higher and higher ratio of engineers to total working force can there be a shortage of young engineers? The Engineering Joint Council estimated a shortage of 25,000 newly graduated engineers for the year 1952. And a shortage is expected for several years to come.

Mining's Position

Where do we stand in the field of mineral industries? Unfortunately, there are no detailed data on a national or industry-wide basis upon which we can rely. We can, however, point up generalities and on the basis of these generalities suggest solutions. At present there are not over 12,000 engineers engaged in the mining industry in the United States, exclusive of petroleum and natural gas. This sounds like a big number but it is little more than 4 percent of the total number of engineers engaged in industry. There is probably one engineer in the mining industry for every 50 persons directly engaged in the industry.

The *Journal of Engineering Education* reports that for the school year 1952 and 1953 there were approximately 1300 senior engineering stu-

dents in mining, metallurgy, geology and ceramics. Probably not over 1100 of these will be available for, or will enter, the mining industry. In other words the best estimate is that there is available each year one graduate engineer in the mineral industry for every 12 or 13 already engaged in the industry. This is encouraging if the rate can be kept up. For all industry in the United States, there is about one graduate engineer entering industry each year for every 18 or 19 engineers already engaged therein. However, the mining industry is much more dependent upon engineers for its managing, directing and motivating force. The ratio of engineers in the mining industry to the total working force should be somewhat lower than a similar ratio for industry in general. Indeed, the mining industry is nearly twice as dependent upon the services of young engineers as industry in general. We should, therefore, make double the effort and show twice as much interest in getting young engineers to join the industry.

ESTIMATED NUMBER OF MALE ENGINEERS, BY FIELD OF EMPLOYMENT, 1950*

Manufacturing: durable goods	176,000	
Manufacturing—non-durable goods	55,000	
Total in manufacturing		231,000
Trade, finance, and service industries	44,000	
Professional service fields	31,000	
Total in trade and service		75,000
Construction		45,000
Utilities		25,000
Communication		16,000
Mining		12,000
Transportation		11,000
Agriculture, forestry, and fishing		1,000
Total in private industry		416,000
Federal government		51,000
State and local government		42,000
Total in government		93,000
Professors and instructors		8,000
Others in education		5,000
Total in education		13,000
Grand Total		522,000

* Based on 1950 Census sample. Excludes about 7,000 women, and others who were retired or not employed for other reasons at the time of the survey. The Engineering Manpower Commission estimates that there were 450,000 engineers in 1952 on the basis of its correction of Census data.

Excerpt from National Manpower Council report "A Policy for Scientific and Professional Manpower."

UNDERGRADUATE AND GRADUATE ENGINEERING ENROLLMENT
UNITED STATES AND CANADA
1952-53
201 SCHOOLS
(From Journal of Engineering Education, February, 1953)

Schools	Courses	Fresh.	Soph.	Junior	Senior	5th Yr. and Others	Total Under-Grads.	Grad. Stud's	Grand Total
30	Mining	246	232	260	344	31	1,113	55	1,168
46	Metallurgical	508	458	542	585	169	2,262	823	3,085
22	Pet. & N. Gas	1,149	674	627	696	103	3,249	199	3,448
13	Ceramic	121	99	105	125	16	466	113	579
23	Geological	302	231	247	244	47	1,071	102	1,173
	Total Mineral Engineers U. S.	2,326	1,694	1,781	1,994	366	8,161	1,292	9,453
107	Chemical	3,822	2,804	2,263	2,375	1,440	12,704	2,322	15,026
137	Civil	5,323	4,497	3,969	4,406	2,088	20,283	2,110	22,393
132	Mechanical	7,823	6,429	5,339	5,413	4,331	29,335	3,456	32,791
135	Electrical	7,263	5,822	4,821	4,804	3,986	26,696	6,152	32,848
59	Industrial	1,097	1,111	1,105	1,390	370	5,073	1,570	6,643
(Calc	Other Engrs.	4,665	3,368	2,960	3,048	1,753	15,794	3,037	18,831
92	Unclassified	13,535	911	131	23	5,524	20,124	409	20,533
149	Total Engrs. E.C.P.D. Schools	45,854	26,636	22,369	23,453	19,858	138,170	20,348	158,518
44	Other U. S. Engr. Schools	5,777	3,583	2,642	2,511	3,997	17,910	121	18,031
193	Total U. S. Engineers	51,631	30,219	25,011	25,964	23,255	156,080	20,469	176,549
8	Total Canadian Engrs.	1,854	1,289	992	1,080	384	5,599	213	5,812
201	Grand Total U. S. & Canada	53,485	31,508	26,003	27,044	23,639	161,679	20,682	182,361

Specialization on Increase

As in the case of most industries, mining is becoming more technical and specialized and requires the services of an increasing number of specialized people, both in management and service groups, as well as in the daily labor force. The high degree of mechanization requires higher skills of the labor force than ever before. To direct this labor force, management must be more highly skilled and more specialized than ever before. The problem of the executive today is more and more one of correlating the activities of these specialized people and their ideas.

Out of this arises one of the major problems confronting the mining industry. That is the problem of absorbing and properly training the young engineer to utilize his skills to the maximum benefit to himself and to the company, not only for the present but also in the future when he may be called upon to supervise and manage people. He must rub off a lot of specialization and take on a good deal of generalization.

While there were 1300 senior students in mineral industries schools for the term 1952-1953, there were also at the same time an additional 1300 students doing graduate work in the field of mining. Indicative of the trend too is the fact that one fifth of the new students entering Harvard graduate school of business in 1952 were students who already have engineering degrees. Our young engineers are going all out to obtain the specialized training they think industry demands of them. The present managers of industry must take a keen interest in applying this specialization where specialization is needed, but perhaps more important to mellow it so that it fits into the over-all welfare of the organization.

Job Placement Difficult

Because so many of our young engineers are continuing into advanced studies and research before entering industries, it is becoming progressively difficult to place these young men in starting jobs in the industry. It is in the labor force or as junior engineers that the basic training in industry, leading toward managerial positions, is begun. Industry may be willing to start a highly specialized young man in a labor job or as junior

engineer, but the young man himself is often reluctant to do so. His immediate talent may call for a more specialized job than that of a miner or mill hand, but the future career of the young engineer who does not remain in research or in a specialized field may call for just such diversified experience and training he would get in such a job. He can ill afford to go back and pick up such training after he has been working for a number of years.

At the outset of his employment in industry, the young engineer has done his part as regards preparation. Thereafter, his personal initiative will pay off. He must continue to do his share, but his advancement is directly dependent upon those who direct and supervise him. Their attitudes, skills, outlook and accomplishments will be a major factor upon his future value to the company and his personal success.

Need On-Job Training

There has never been a time when management has not been trying to train people so they can cooperate with and in turn gain more cooperation from other people, in other words to make managers out of them. Every organization has such a program now whether they realize it or not, but managerial training should be part of a more formalized program. By the need for a somewhat more formalized management development program is meant a program that steps up the emphasis on developing people so they can rub elbows with and get more cooperation from other people; a program that steps up the emphasis away from a hit and miss development of the young engineer and those who supervise and surround him. The program should be an accelerated education in human relations with a major underlying emphasis on the training and development people in the very fundamental prerequisite for succeeding in any job, that is, the art of getting along with other people.

No Shortage in Northwest Now

By CHARLES E. SCHWAB

BASED on personal experience in many non-ferrous operations in the Pacific Northwest, there is no shortage of young mining engineers right now. There was a shortage in the immediate past. The opinion, that in the immediate future all needs will be met, is made with "fingers crossed" because of the small numbers of young men enrolled in colleges for technical training.

The range of starting salaries is from $325 to $425 and a median would be about $375 per month. Competition has been keen with other nonmining or nonsmelting industries and the starting salaries of the mining industry are thought to be in line with the competition. However, inability in the mining industry to guarantee certain other items, such as definite promises of advancement in responsibility and salary in expanding industries place mining at a disadvantage.

Stress Quality

Industry in general has been criticized for wasting its technical men by assigning them routine duties which could be done by high school graduates with sufficient background in mathematics plus on-the-job training. Some of this routine work may be odious to the young engineer, but there is no substitute for a certain amount of it in preparation for becoming a qualified engineer. It supplements his text book education and gives him the experience he needs to meet the industry's requirements.

It is of interest to note that quality of young engineers was emphasized among the chief engineers, geologists and metallurgists in the Northwest. Just having enough engineers to meet their needs is really only half the problem. Most felt that they would prefer to be short in numbers rather than short in quality of engineers.

Ups and Downs Discouraging

While there apparently is no shortage now, it is disturbing to learn that when a questionnaire was answered by Spokane high school graduates to find out what choices of professions they were considering, only one out of 400 seniors who returned the questionnaire was interested in the mineral industry, and he expressed a preference for metallurgy.

Equally disturbing to the lead and zinc operators is the present crisis in that industry caused by the flood of foreign imports, which in turn causes depression of the market. Projects or plans requiring additions to their present engineering staff—or even work for their normal staffs—are shelved. In the event of a shutdown, technical men scatter just as fast as competent mine crews do when dismissal and layoffs occur. The recent history of "boom or bust" in lead and zinc mining have caused these operators to face the question honestly, "If I were a young engineer, would I apply for a job at a lead-zinc operation today?"

Underground experience supplements the young engineer's textbook education

An Educator's Viewpoint

By DR. J. ROBERT VAN PELT

THOSE of us engaged in mineral industry education are one step removed from the daily problems of company operations. This perspective allows us to view the mining industry with an eye to the future. One thing you can see is an increasing difficulty in supplying the industry with the technical manpower it needs and demands. This trend is long-term in nature and independent of the short-term ups and downs.

There is a need in all four of the major technical fields serving our industry: geology, mining, mineral preparation and metallurgy. Let's take a look at each of these. Geological principals assure us of many wealthy ore bodies awaiting discovery. They will be discovered only when we develop better techniques for ore search. We need men highly trained in these techniques to keep the necessary reserves in stock. This means more geological engineers with new types of skill.

In mining, we anticipate better control of rock masses underground and steadily improved mechanical equipment. This means we need mining engineers in greater numbers to handle the increased technical load and it means more specialized training for these men.

In mineral preparation, the trend is toward lower grades of ore. This means more highly developed ore breaking techniques with greater training in what used to be regarded as the purely academic aspects of physics and chemistry. Future mineral preparation specialists will have to be scientists as well as engineers.

Modern extractive metallurgists must be prepared to make a wise choice between a wide range of popular methods from precise control of pyrometallurgical properties to so-called chemical metallurgy and be prepared to operate a plant using any of these methods. In short, there is a trend toward more mineral industry engineers and toward new types of training for them. However, there is a prospective decrease in the supply of men. Educational leaders are working toward an opinion that a shortage can be met by raising quality rather than by increasing the number, although both are desired.

Contact Students Early

Most contact with prospective engineers by the industry start with college seniors and recruiting officers on the campus. A few companies take interest even in sophomores. Consolidated Mining and Smelting has an excellent program for juniors. In the summer following the junior year, selected students are brought in as summer employes. This establishes mutual acquaintance before an offer of regular employment is made. If such a program could be pushed down a year earlier, it might even tempt the young man to elect mining, metallurgy or geology rather than some other branch of engineering not related to the mineral industry.

Many young men, however, make their vocational choice still earlier—in high school. To reach them it is suggested that a first-class motion picture be produced on a vocational scene. It would tell the high school boy, his friends and parents what he personally will do if he becomes a geologist, a mining engineer or a metallurgist. If produced by the combined interests of the industry, the cost to any one company would be insignificant and the returns would in all probability be substantial and not long delayed.

Suggested Plan of Action

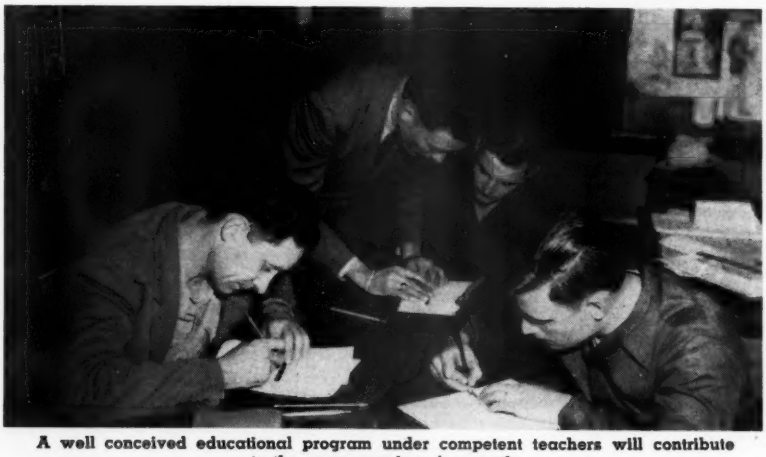
Individual companies, however, need not await such action. There are many projects—national and local programs. Three have recently been proposed by a committee of the American Society for Engineering Education. The first is to encourage the study of mathematics in high school. Second recommendation is that the industry might offer summer employment to high school teachers of mathematics, physics and chemistry and to vocational instructors to acquaint these people with company operations and policies.

A third recommendation is similar; namely, that high school and college teachers be encouraged to study company operation and use the resulting data as teaching material in economics or economic history or labor relations.

A well-rounded program to encourage mineral engineering will go beyond high school and college to the general public. Perhaps the best way for a company to go into that part of the program is to utilize the material prepared recently by the Advertising Council in their "Engineers Wanted Campaign."

Build Morale on Job

After the young men have entered mineral engineering, they must be given the best possible opportunity to grow. Only in such an atmosphere can the kind of morale be built that will attract the best men. One way to contribute to the engineer's growth is through a well conceived program at the individual operation. These may or may not involve study on company time, but the best programs usually do. They also include the use of competent educational staff, either full time, or call upon outside educationalists on a part time basis. Instruction may be limited to technology, but the more complete programs include a part time training program of from one to five years to prepare men for management. The success of such a program depends on its being put into the hands of highly qualified personnel who are given the necessary assistance to prosecute it.



A well conceived educational program under competent teachers will contribute to the young engineer's growth

The logn-term need can best be met by long-term planning and active, well-staffed programs. Because top policies are involved, top level decisions are needed in order to start and maintain such a program. The money that is needed can be fully justified on a practical basis of the welfare and progress of the company itself. To set up a good program for the growing need for young men in mineral engineering will require the combined thinking of personnel officers, public relations directors and educational advisors.

Future Outlook and a Suggested Program

By RICHARD A. YOUNG

A SURVEY made by the Engineering Manpower Commission of the Engineers Joint Council in 1952 showed that industry needed 40,000 new engineers per year. In that year 29,420 received their first engineering degrees. Of these about 20 percent were immediately commissioned in the armed forces because they were ROTC members. A good proportion of the remainder were probably drafted or enlisted.

A survey made by Northwestern University indicated that 176 companies obtained only 68 percent of their needs for engineering graduates in 1952. This graduating class was relatively large compared to the classes expected in 1953, 1954 and 1955. The engineering class of 1953 was only about 23,000. The 1954 class is estimated at 19,000 and in 1955 the figure is estimated at 22,000. Out of these 23 percent of the class of 1953 were in ROTC as were 45 percent of the class of '54 and 55 percent of the class of '55. But it would appear that there was only a maximum available to industry of about 25 percent of the number needed. In the years ahead more than 5200 companies are going to be battling for the meager supply of young engineers available. The industries which normally hire most of the young engineers will undoubtedly do what they can to steer all engineering students into the fields which relate to their industries. The advantages of majoring in electrical, chemical, mechanical and civil engineering will certainly be emphasized by the industries which have a crying need for these types of engineers.

How Will Mining Fare?

The U. S. census of 1950 reported a total of 519,000 professional engineers in this country. Of these approximately 5 percent reported themselves as mining or metallurgical engineers. In October of last year, the U. S. Office of Education made a survey of the enrollment of engineering schools of the country and of the number of students enrolled in each branch of engineering. In the class of 1953, 3.8 percent of all engineering students were enrolled in mining and metallurgy. In the class of 1954 the percentage had dropped to 3.1. In the class of 1955 it had dropped to 2.3 and in the class of 1956 it was down to 1.6 percent. In the period of scarcity of young engineering graduates, mining and metallurgy is not even getting its historical share of such graduates.

The class of 1956 will be one of the largest engineering classes of recent years. With normal attrition there will be 167 mining engineers and 312 metallurgists graduating in 1956. When this is compared with the 400 engineers and 580 metallurgists graduated in 1952, a year in which the total graduates about equalled the estimated total for 1956, it seems clear that the mining industry has a job to do if it is to maintain its engineering staff and replace the engineers lost through death or necessary retirements.

Push Over-All Program

Our first job is to do all we can to help increase the number of young men who enter and graduate from our engineering schools. To do this, we should cooperate in every way possible with the Engineering Manpower Commission of the Engineers Joint Council. Their publications including their pamphlet, "How Your Company Can Help Promote Engineering as a Career" and their news letter lists many ways in which we can help as companies and as individuals.

Second: the Engineering Manpower Commission has suggested that companies establish scholarships for engineering students or offer part time work to help students finance themselves. According to Dean Eschbach of Northwestern University, most of the attrition in engineering schools today is caused, not by scholastic failures, but by a lack of funds.

Third: check the high schools in our communities to make sure they have adequate science departments. Fifty percent of the high schools in this country do not offer a program which will prepare a student for entrance into an engineering college.

Fourth: we should publicize the advantages of engineering as a career to all high school students and their parents in our communities, and especially to our employes through house organs, bulletin boards, etc.

Fifth: we should put our advertising to work. The Advertising Counsel cooperating with Engineers Manpower Commission, can supply free copy and mats for any medium of advertising.

And Then—

The next step in our program is to insure an adequate supply of mining and metallurgical engineers and geologists. To do this, we must publicize

(Continued on page 80)

"Well, I got through the first day okay, Mr. Frinddt—Let me hear that talk again about opportunities and advancement"

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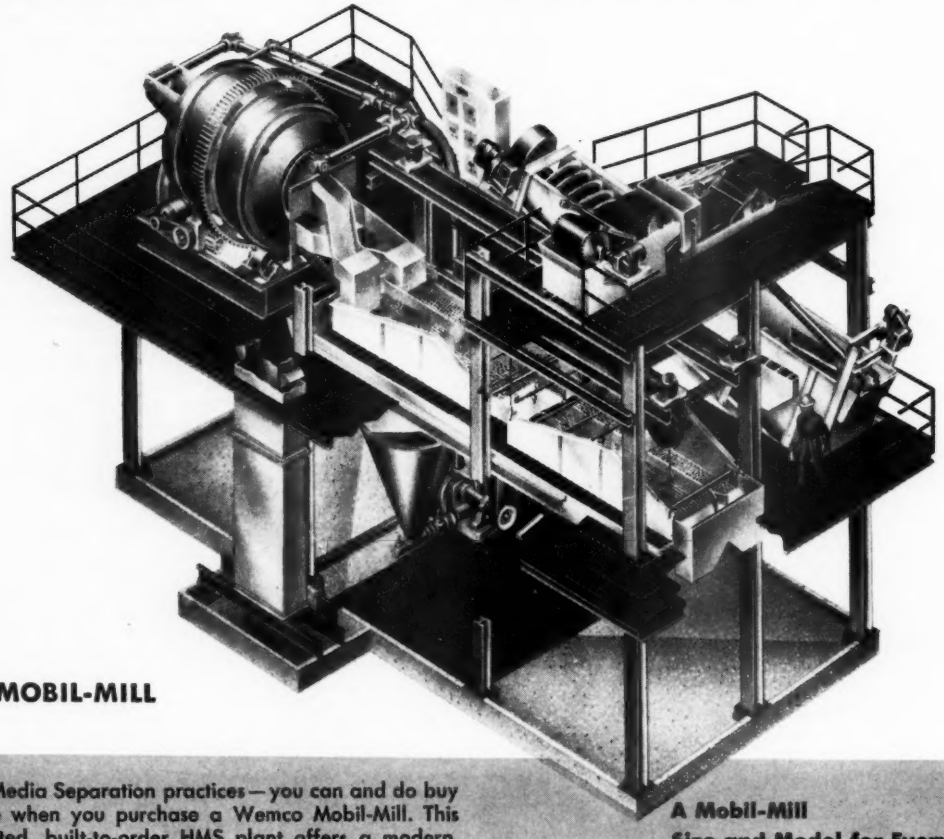

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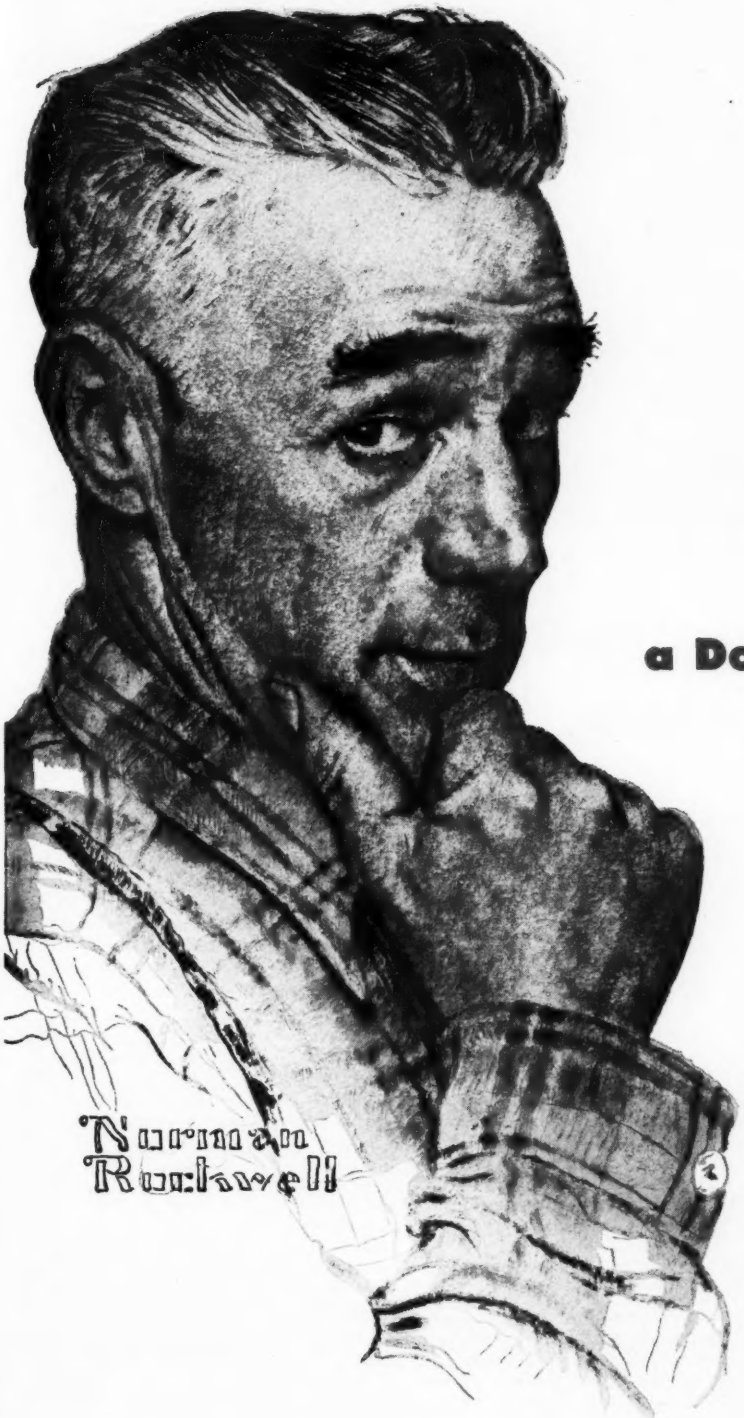

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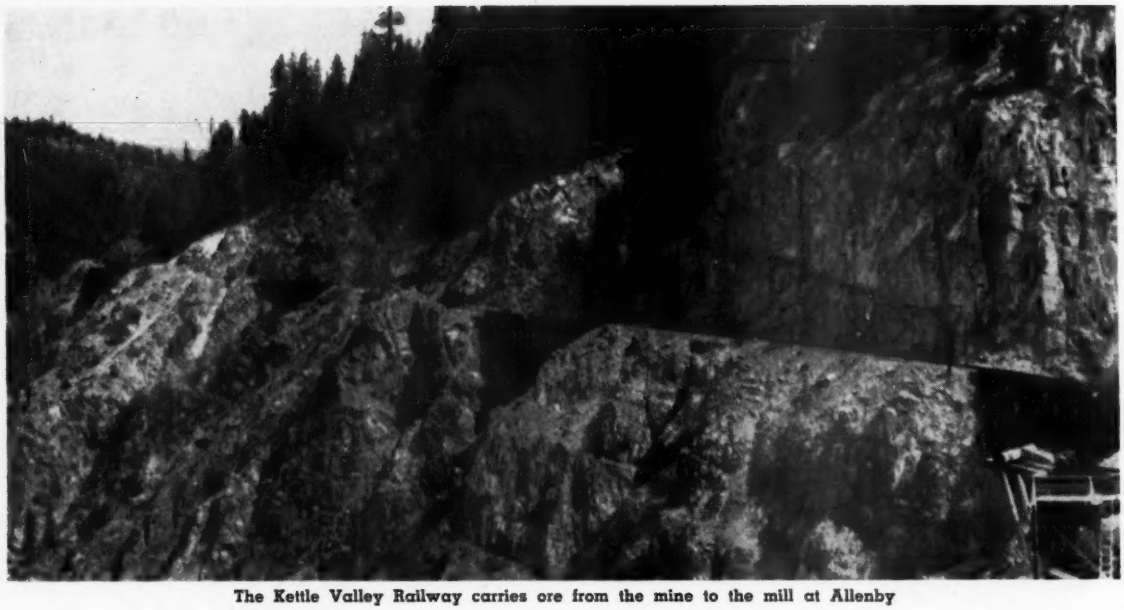


The Kettle Valley Railway carries ore from the mine to the mill at Allenby

Recent Developments at Copper Mountain Mine

Percussion Drills for Long Blastholes Underground—Wagon Drills Expected to Lower Open Pit Drilling Costs

By L. T. POSTLE
Vice-Pres. & Gen. Mgr.
Granby Consolidated Mining Smelting & Power Co.

THE Copper Mountain mine of The Granby Consolidated Mining Smelting and Power Company, Limited, is located in southern British Columbia close to the United States border, about 200 miles east of the city of Vancouver; more specifically it is 13 miles south of the town of Princeton on the Hope-Princeton highway. An excellent view of the mine across the Similkamsen Valley can be had from the Hope-Princeton highway where the B. C. Department of Public Works has erected a sign at the viewpoint.

Granby is one of the oldest mining companies in Canada. It was formed to mine the ore bodies in the Grand Forks district of British Columbia at the start of the century. Later, its major sphere of interest was transferred to Anyox and finally to Copper Mountain. Perhaps Granby's best known contribution to mining is the Granby mine car, which was developed at Grand Forks about 1905. The inventor is unknown but a draftsman named Frank Knott is reported to have had considerable to do with it. This type of car has been copied the world over and is still manufactured.

In view of the vast amount of technical literature available* regarding this mine we will confine this discussion to more recent developments, particularly those taking place during the last two years.

The ore bodies themselves were located near the end of the last century and development was in progress at various times until the latter part of the first world war, when a concentrator was built to treat the ore. The property was bought by the Granby Company in 1923. Operations were not continuous, however, the mine being operated during high copper price periods only until 1937.

The concentrator was built at Allenby about eight miles from the mine and is connected to the mine by a branch of the Canadian Pacific Railway over which the crushed ore is transported from the mine to the concentrator. The copper concentrates in recent years have been shipped by railway to the Tacoma Smelter of the American Smelting and Refining Co.

In addition to the mining plant at Copper Mountain and the mill at Allenby, the company operates its own power plant at Princeton where coal, generally purchased in Alberta, is converted into electrical energy for all phases of the operation. It is interesting to note that low grade coal (approximately 9000 BTU's per lb) costing about $6 per ton laid down, produced power at a cost of just over one cent per kilowatt.

Always a Low Cost Mine

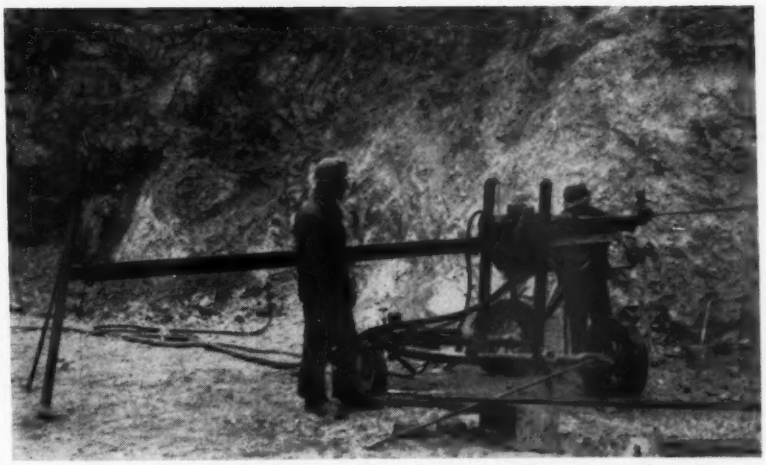
The mine has always been noted for producing ore at low cost. The average grade of the ore mined has not been above one percent since 1949 and

* Western Miner issue of December, 1948; the C.I.M.M. Bulletin of June, 1950, and the C.I.M.M. Bulletin for May, 1951.

the long rail haul between the mine and mill, coupled with an obsolete concentrator and a refractory ore where recoveries over 80 percent are difficult, means that the mine must be operated in a very inexpensive manner.

In the early days mining was done by conventional methods, ore being broken by rock drills and drawn off through grizzly chambers into mine cars. The labor shortage during the last war caused considerable study towards increasing efficiency, and two major changes were made. The grizzlies were replaced by concrete lined scraper or scram drifts, as has been done in so many mines, with a great increase in the efficiency of secondary breaking, and the mining method was changed to caving. The ground is very weak, as evidenced by much subsidence in the areas around the mine, so that when study was applied to the mining problem it became obvious that some caving technique was the logical method to apply to the ore bodies and a method was worked out whereby caving was induced after undercutting by drilling horizontal diamond drill blast holes from raises in the lower portions of the ore bodies. The change to caving and scraper drifts caused a sharp drop in operating costs and enabled the company to continue operations in the face of rising costs and a fixed copper price.

In recent years the major changes in the mine have been to replace the heavy drifter type of drill mounted on columns to a lightweight, jackleg machine using light integral tungsten-carbide tipped steel for all development work. The efficiency of tramming in lateral development has been greatly increased with the use of air trammers, coupled to large three-ton cars which are dumped by means of air cylinders connected to the air trammer. These inexpensive units have sharply reduced the cost of driving short drifts and crosscuts.



Recent experiments with wagon drills and new type bits gave good results

Diamond Drills Replaced

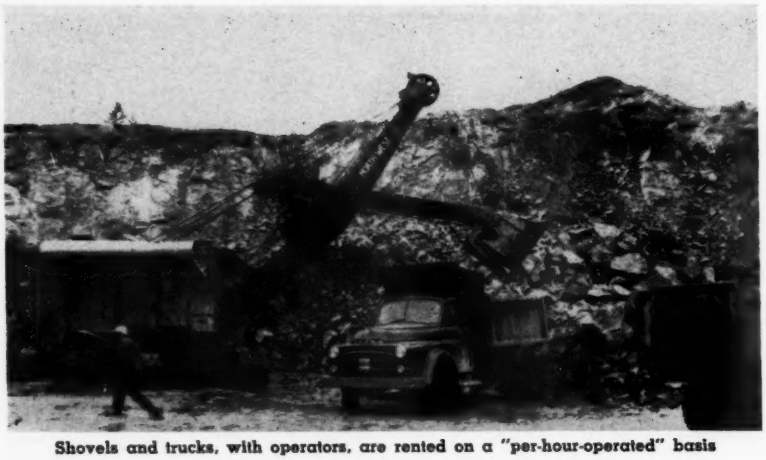
During the past year the blast hole diamond drilling to induce caving in the stopes has been entirely replaced by percussion drilling. The development of a satisfactory jointed steel drill rod with a detachable tungsten carbide insert bit used in conjunction with a 3½ or 4-in. heavy drifter has drastically reduced the cost of blast hole drilling. Blast hole drilling now costs $0.55 per foot with percussion drills in comparison to $1.07 per foot for diamond drilling. Furthermore, the larger holes (2⅛ in. compared with 1$^{3}/_{16}$ in. drilled with the percussion drills allow greater burden and it is possible to break 4.23 tons per foot of hole compared with 2.77 tons when using diamond drill holes. Holes are ordinarily drilled 60 to 100 ft, but they have been drilled as deep as 140 ft.

As described in many of the previous papers it is necessary to put a heavy concrete lining in almost all the scraper drifts. This is very expensive, especially when the gravel to make concrete must be hauled several miles to the mine and the only gravel available is not very good quality. Investigation showed that waste rock as broken in development headings could be used for aggregate and that it made better concrete than the gravel that was available. The cost, of course, is much lower. It is felt that there is still room for improvement here and the idea of designing some sort of an underground plant for the preparation of better aggregate is receiving consideration.

Study Geology

In an effort to find more new ore, the mine and adjacent areas have been given very careful geological study, followed by a large amount of core drilling. The limits of known ore bodies are now investigated in much greater detail by core drilling before mining plans are prepared in an effort to reduce the great amount of dilution inherent in a caving system. Unfortunately much of the mine has been destroyed by caving and is therefore inaccessible. There are many surface exposures of what might be copper ore close to the mine, and a careful study has been made of these exposures in an effort to find some ore which could be mined by surface methods—that is, power shovels and trucks. Three areas were diamond drilled in considerable detail. The first of these, the so-called Princess May area, was drilled by vertical holes on 100-ft centers. This drilling outlined an ore body containing slightly over 1,000,000 tons which could be mined by shovels. Furthermore, there was an old working to surface within a few hundred feet of this area into which ore could be dumped and then removed through

Machine shop, compressor house and mine offices are the nerve center of operations at Copper Mountain



Shovels and trucks, with operators, are rented on a "per-hour-operated" basis

the mine haulage system. Shovels and trucks were rented and an open pit operation was started early in the summer of 1952. Mechanically this was a success, but metallurgically the ore proved very refractory to treatment and only a little of it can be handled through the mill at one time.

In a second area, vertical drill holes did not indicate the presence of any ore. However, old drill holes drilled in 1914 did offer encouragement and mining was started on an exploratory basis at two points where small masses were clearly indicated by surface exposures. These masses proved to be fairly small and it is doubtful whether a profit was made. However, there was sufficient encouragement to justify further work, and in the fall of 1952 it was decided to cut a man-sized channel sample across an area which was thought to contain ore but which had been a failure when drilled. This was done by cutting a trench with a power shovel 20 ft deep and 30 ft wide. This trench cut through about 200 ft of oxidized barren rock before it exposed one of the more sizable ore bodies at Copper Mountain. More than 70,000 tons have been mined and there are additional positive ore reserves of about 150,000 tons.

Careful geological study indicates that the vertical drill holes in most cases followed minor faults. Both core and sludge recovery was very poor. Geological mapping here after the pit was opened up showed that the copper minerals occur in closely spaced fractures, and that these ore fractures are generally parallel. At the present time a new drilling program has been laid out to drill at approximately right angles to the ore fractures, and the first few holes have justified the belief that a major ore body is present.

Efforts are being directed to develop a third area for open pit work, and one small one has been located containing about 100,000 tons of ore. An adjacent area is extremely interesting but it has been badly broken up due to subsidence as the result of underground mining, and it is impossible to drill it. The surface has been carefully sampled and it is the intention to strip the surface off with bulldozers and attempt to mine it without making any effort to determine its size or metal content.

All open pit work so far has been experimental; in no case have there been sufficient ore reserves to justify the purchase of heavy churn drilling equipment such as is commonly used in open pits. One wagon drill was secured when this work was started since it seemed the logical tool to use, but results were indifferent and it did not compete with light 50 lb jackhammers using tungsten-carbide tipped steel. These light machines could drill holes as deep as 30 feet and the miners were accustomed to using them so they produced broken rock at a reasonably low cost. In recent months more experiments have been made with the wagon drill using different types of bits with very much better results.

Two diesel power shovels are currently in operation, a 1¼ cu yd and a 1½ cu yd shovel. Both of these machines are rented with the owners being the operators. Payment is on a per hour operated basis. Trucks are similarly rented from small trucking contractors and individual owners. The conventional three-ton truck hauling an average load of six tons has proved flexible and suitable for the preliminary work. Recently some larger trucks have been hired. These loaded to 11 tons appear to be very satisfactory and have sharply reduced the cost of hauling ore.

Roads Expensive

Road building between the various pits and dumping points has proved to be inexpensive. The surface is weathered and soft so that most of the rock can be moved by a bulldozer. One very good stretch about a mile long was built by a bulldozer in five days at a total cost of slightly over $1000. This of course did not include surfacing.

So far all the ore mined in the open pits has been dumped into old mine openings and drawn off into mine cars through chutes for haulage to the crushing plant. In some cases this haul has been over a mile. There is currently under construction a large bin (capacity 50,000 tons) cut into the rock above the crushing plant. Trucks from the various surface pits will discharge into this bin. The ore will be hauled to the crushing plant by a shuttle train, a distance of about 500 ft.

As this is being written, 1500 tpd is being produced in the pits, but on completion of the above described arrangement it is expected that one-half of the required mill feed (5000 tpd) will come from this source.

Good housekeeping underground is important. This is main haulage drift on sixth level

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Shuttle Car Loading onto Belt Conveyors in Thin Seams

Shaker Feeder Proves Successful in 38-in. Coal and Can Be Used in Lower Seams

By C. H. WILLIAMS
Chief Engineer
Red Jacket Coal Corp.

THE Red Jacket Coal Corp. operates six mines in southern West Virginia and one in southwestern Virginia. Production at these seven mines averages 18,000 tpd of processed coal.

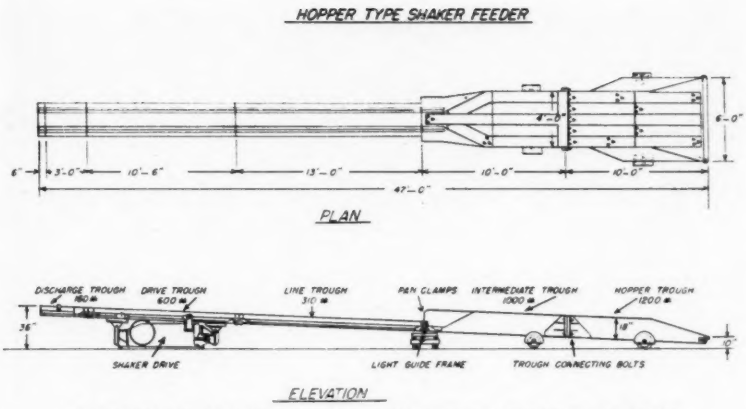
In 1947 the first shuttle cars were purchased and installed and in 1948 the company began loading belt conveyors directly from shuttle cars in a new all belt-conveyor haulage mine. Now, 80 percent of the daily production is loaded into shuttle cars. Thirty percent of this coal is loaded from the shuttle cars onto belt conveyors for transport to mine cars or storage bins, thence to preparation plants by rail or motor truck haulage. Of the coal thus handled, 60 percent is mined from seams less than 40 in. thick. At Red Jacket it has been determined that shuttle car loading directly into mine cars is preferable when it can be accomplished without providing additional height for haulways. In areas where the coal is over 40 in. thick, loading directly into mine cars is common practice. Two of the company's older operations are in coal under 40 in. thick, as is a third one which was put in production in March, 1954. Shuttle car loading into belt conveyors is practiced on a limited scale at two other plants.

Two cable reel shuttle cars with a capacity of two tons each serve every mobile loading unit. Shuttle cars are 26 in. high and loading machines are 24 in. high. Generally, the roof is good, requiring only line timbers and safety posts. Where necessary, roof bolts or a combination of roof bolts and timber is used to provide adequate support. The bottom is normally firm and planking of roadways is rarely necessary.

Direct Loading Hurts Belts

At first, shuttle car loading of belt conveyors was accomplished by discharging directly onto the belt from the shuttle car. This is the most unsatisfactory of the methods tried. Disregarding the excess wear on the belts caused by scuffing, impact and misalignment, the spillage resulting from such loading requires the services of a clean-up man at each loading point. This is in itself prohibitive from an operational cost standpoint. Then, too, constant bumping of the conveyor frame during side loading makes proper alignment virtually impossible. Control of discharge from the shuttle car is difficult as dry coal and wet coal; lump coal and fine coal each flows in a different manner. Another important factor involved is the extra unloading time required which materially affects production.

Rapid deterioration in the rubber belting is also a prime cause for dis-



If needed, the 13-ft line trough can be taken out to shorten the feeder

satisfaction with this method of loading. All mine belt conveyors in service are inspected once each quarter and a report is compiled from the information secured. Amounts of belting in good, fair and poor condition are listed in addition to that requiring immediate repair. Condition of the belt conveyors is determined, and items needing repair, replacement and/or attention are also noted. In this way, a close check on belt maintenance and replacement costs is possible. These costs have decreased rather sharply since the practice of loading directly onto the conveyors from shuttle cars was stopped.

Try Side Loading

Before finally deciding that direct loading was not the answer, loading stations were installed for side loading. These stations consisted of movable metal sideboards, counterbalanced to rest in an open position when not in use. When approaching the conveyor, the shuttle car engaged a lever which moved the sideboards together and coal discharged from the shuttle car was channeled into a space somewhat narrower than the belt. This was an improvement over the first method. However, the passage of coal through the loading station from points inby was hindered when the loading station was in a closed or operating position. In addition to this, the spillage problem was far from solved.

In conjunction with the movable sideboards, a large hopper around the tail piece of the conveyor was used for parallel loading. While these were accepted as improvements, they were far from satisfactory.

At the time these developments were taking place, the idea of using a chain and flight conveyor for belt loading was suggested. There were a number of idle 12-in. wide room conveyors on hand, so it was possible to experiment with a minimum of investment. It was decided to construct such a loading device in the Central Machine Shop. Flared sideboards were welded to the conveyor pans. This addition resulted in a conveyor pan 4 ft 8 in. wide at the top, 12 in. wide at the bottom and 1 ft 6 in. high. Its length was 36 ft, which included 26 ft of conveyor and 10 ft of ramp. The remainder of the device was 21 ft long and consisted of the drive section and a sufficient number of pans with four-in. sideboards to raise the coal high enough to discharge over the side or tail piece of the belt conveyor. The shuttle car straddled the conveyor on runways constructed of 3-in. by 18-in. channels. It began discharging near the front end of the larger conveyor pan, backing off as the load was discharged.

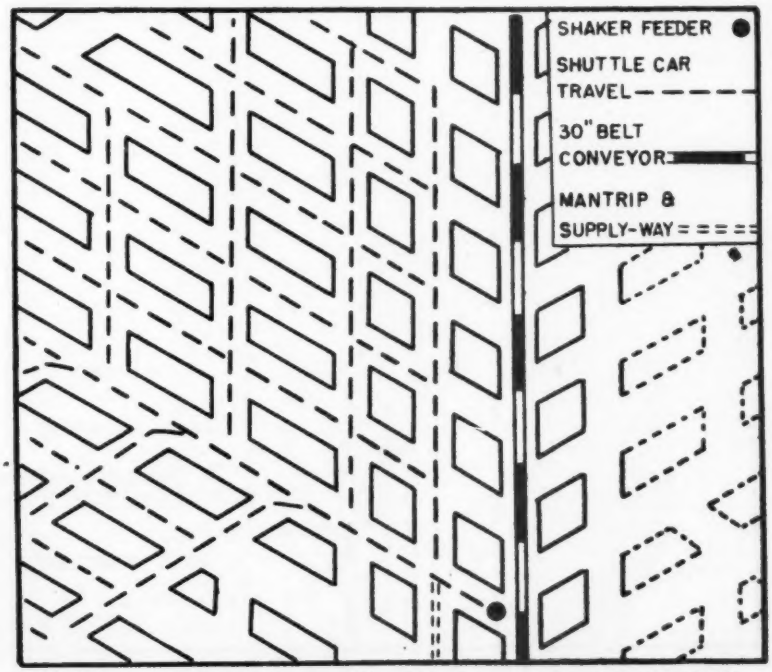
This device had a capacity of 3½ tons and permitted a shuttle car to unload without interruption. The main objections were: (1) Fine coal fed out first, leaving the larger lumps which were difficult to transport alone; (2) too much time was consumed in dismantling, moving and setting up; (3) too many parts were needed, and (4) the device, being 18 in. high, could not be used as such in 40-in. coal.

While the company was experimenting with chain and flight conveyors as the means of solving the belt loading problem, two different hopper-type shaker feeders appeared on the market. Investigation of these led to the conclusion that they were the most satisfactory yet produced and an order was immediately placed for one to be used with a shaker drive on hand.

Move Shaking Feeder Easily

By early May, Red Jacket hopes to have 15 of these units in service. With an over-all length of 47 ft, the unit is 10 ft shorter than the chain and flight conveyor feeder described earlier. It may be made 13 ft shorter by eliminating the section of line trough. This has been done and found mildly satisfactory. However, more excavation for the shaker drive or more blocking is required. The company favors using the one section of line trough. Even then, there are only five major parts to move and assemble.

The unit is rugged; but precautions must be taken to assure its being level laterally for best performance and maintenance. The hopper trough is fitted with a set of double wheels which have solid rubber and/or steel tires. The intermediate trough is fitted with the same kind of wheels except that they are single. The feed-



Haulways are separated where possible and kept to a one-way distance of 400 ft

er is driven by a shaker drive operating at approximately 78 strokes per minute. By the addition of 13-ft sections of line trough, the feeder may be lengthened. There has been no need to do this and it is felt that there would be no particular advantage in doing so. Whatever is added must be handled, dismantled and moved or stored.

The low maintenance experienced thus far with these devices is believed to be due, in large measure, to the relatively small loads they are handling. Drives are capable for handling many times the loads they have been called upon to carry.

Moving is simple. The intermediate and hopper troughs are disconnected by removing four bolts. The shuttle car moves these parts quickly to the next location. Line and discharge troughs can be loaded either into the hopper or into a shuttle car for transportation.

Keep Hauls Short

The shuttle car haulage system is designed so that each of the two shuttle cars which serve a loading machine travels a separate roadway for as great a distance as possible. Travel distance is limited to 400 ft in one direction except in extreme cases. In irregular areas caused by boundary lines, outcrop or old mining limits, this distance is lengthened to 500 ft. Numerous time studies have shown the company that travel distances greater than 400 ft result in excessive waiting time for the loading machine.

In 38-in. coal an excavation in the bottom seven ft long, four ft wide and four in. deep, is provided for the shaker drive. In thinner coal the depth of the excavation is proportionately more. This gives ample clearance for large lumps and decreases the distance which the coal must drop from the discharge trough to the belt conveyor. Steel plates are placed under the wheels after the unit has been properly aligned and leveled. When this is done, very little attention is required.

Notice the load of coal in the background riding through the feeder

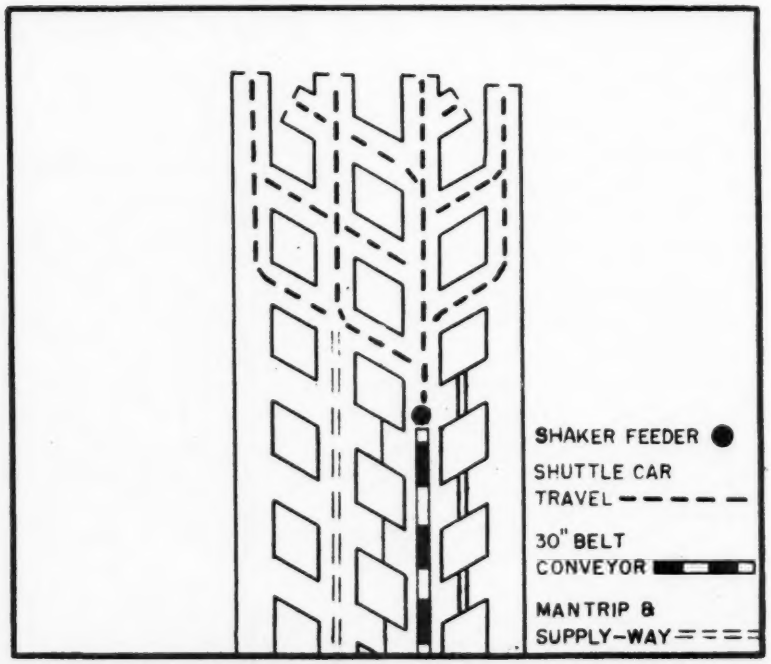
The feeder is designed to receive 3½ tons of coal in one minute and will normally feed that amount onto the belt conveyor in 2½ min.

Push button switches to control the feeder are suspended from the roof, one on each side of the shuttle car runway. The shuttle car operator, bringing a loaded car to the feeder, can reach out and press the button without stopping the car. By the time the shuttle car has reached the feeder, it is operating at full capacity. The shuttle car discharges without interruption and returns to the face. The feeder operates until a time relay, which is set to permit the hopper to empty, opens the circuit. The next shuttle car coming into the feeder goes through the same procedure.

Two Loaders for Each Belt

Wherever it is possible, two productive units are set up with each belt conveyor. The shaker feeders distribute the coal in such a manner as to allow one unit to discharge coal on top of that coming from a unit operating inby. This is done by side loading the belt conveyor. It obviates the necessity of providing a belt conveyor for each productive unit and is advantageous from the standpoint of lower investment requirement. These conveyors are equipped with 30-hp drives and 30-in. rubber belting. Their maximum length does not exceed 2500 ft and they operate at 250 fpm. The belt conveyors are not reversed, as a rule. Track is laid with 30-lb rail on steel ties in an intake entry which parallels the belt and is used for the transportation of men and supplies. The track is advanced as the shuttle car travelways are advanced in order to deliver men and supplies as near the face as possible. Loading machines are rated by the manufacturer at eight tpm. The coal is undercut by shortwall machines transported on caterpillar trucks. Rock salt and calcium chloride are used to allay dust on the shuttle car roadways when necessary.

This system of loading belt conveyors is entirely satisfactory at Red Jacket. The fact that an extra piece of equipment is necessary as compared to loading directly from the shuttle cars is more than compensated for by reduced belt repair and conveyor maintenance.



Room headings are developed according to this plan. Note that a track for men and supplies is carried close to the face

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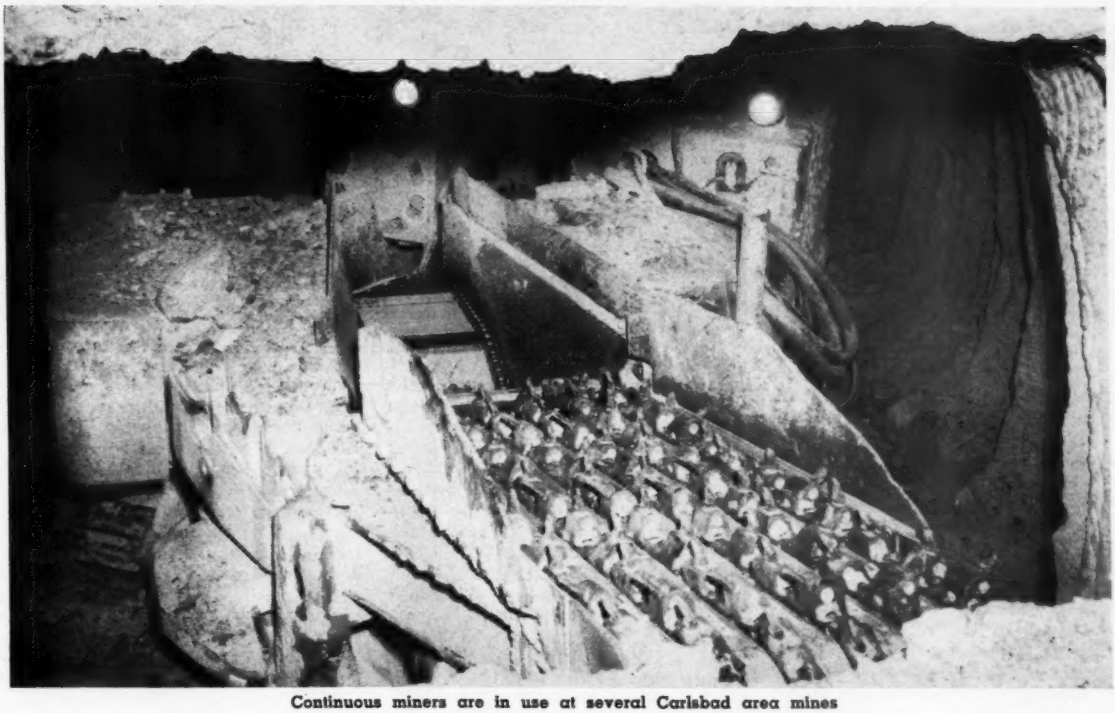


Continuous miners are in use at several Carlsbad area mines

Late Developments In Mining at Carlsbad

Keen Competition Means Sustained Efforts to Achieve Low-Cost, Highly Mechanized Operations

By A. B. CHAFETZ and E. C. SKINNER

Assistant Superintendent Maintenance and Engineering and Industrial Engineer, Respectively
Potash Division
International Minerals & Chemical Corp.

THE non-metallic minerals industry has shown a tremendous growth in the past ten years. New uses for non-metallics plus a steady growth of present markets have presented a challenge to the entire industry. As post-war demands on the fertilizer and chemical trades increased, the potash mines at Carlsbad found it necessary to expand existing facilities on the surface including new chemical plants. This expansion has required new and different types of equipment in mining and extensions of existing mining facilities. There are, at present, five operating companies engaged in producing potash and potash chemicals. The introduction of the continuous miner, Diesel-electric locomotives, and conveyor haulage within the recent years, has done more to change past mining methods than any other technological changes.

Mining Equipment

A. Continuous Miners

The Joy 3JCM and 4JCM continuous miners are being used on tests at three of the properties at Carlsbad. One 4JCM miner is connected for 480 v. alternating current operation powered with five motors with a combined capacity of 161 h.p. These motors are 75° C. rise motors, and are totally enclosed, fan-cooled. The miner was designed to cut a maximum width of 18 ft and depth of 18 in., with a cutter head 18 in. wide. The head is equipped with six chains fitted with 168 tungsten carbide bits. Weight of the equipment is 40,000 lbs. with an overall length of 30 ft 7 in., and a height of 48 in. Production depends upon hardness of ore, bit spacing, and chain speed. Various production rates have been experienced in the Basin. An indicated average cut in an eight-ft heading is apparently from 40 to 60 tph. There is no tearing action of the ore as in coal. All material must be cut. The miner is equipped with 600 ft of 4/0, three conductor, 600 v, Type G trailing cable, and is fed usually from a portable mine power center.

The Potash Co. of America has designed and built its own continuous mining machine. It is known as the "PCA Model 150." Patent applications have been filed by the company. Their current modification and expansion program includes the construction of four more of these machines, as well as the purchase of several additional Joy 4JCM machines. Improvements and additions to the underground haulage system and the introduction of more gathering belts are anticipated in the program.

B. Surge Cars

The Joy 60E10 surge car is used at some of the properties with the continuous mining machine. It is designed to be remotely controlled from the miner operator station in order to follow movement of the miner and to

move the load back to waiting shuttle cars. Part of the control is also made available to the shuttle car operator station in order to transfer the load to the shuttle car. When used as a surge hopper to hold material while changing shuttle cars, the miner can operate continuously.

C. Diesel Shuttle Car and Bulldozer

Along with the Diesel-electric locomotive, two other types of Diesel-driven equipment have been introduced underground. They are the Diesel-electric Joy 60E12 shuttle car and a Diesel-driven bulldozer. The Diesel bulldozer is highly desirable for clean-up purposes and for stockpiling. It is used for building road beds underground, hauling heavy equipment, and for gobbing salt waste. Schedule 24 of the U. S. Bureau of Mines is followed in the use of Diesels underground. Exhaust scrubbers are used containing a solution of aqueous sodium sulfite and hydroquinine in water.

The exhaust scrubber solution is composed of 12½ lb of aqueous sodium sulfite and .6 lb of hydroquinine in 15 gal of water. A make-up tank is provided above the scrubber to replenish water that may be evaporated. When the car is in continuous operation, new solution is added each shift.

D. Jumbo Drills

Jumbo drills have been introduced underground. The type most extensively used is of the two-boom, two-operator type. All power is furnished by hydraulic pressure including hydraulic motors for tramming. An electric motor drives three hydraulic gear pumps to give a maximum operating pressure of approximately 1000 psi. The pumps are designed for 1500 psi. Five hundred feet of No. 4, three conductor, 600 v, Type G trailing cable is used on these Jumbo drills for 480 v, alternating current power connection. The best average cycle for drilling, positioning, and withdrawing has been about 2½ min per hole.

Transportation

A. Belts

International Minerals & Chemical Corp. has put into service a 30-in. slope conveyor, 800 ft long. This conveyor receives ore from a 1000-ton storage pocket and delivers it to the underground surge bins ahead of the skip loader at the No. 1 Hoisting Shaft. The conveyor is designed to handle 600 tph minus five-in. material and is powered by a 150 h.p., wound rotor, 2300 v motor.

Duval Sulphur and Potash Co. has introduced a new 30-in. belt gathering system underground which includes the use of a semi-portable single roll crusher. As the working faces advance, the crusher and belts are moved up so that the shuttle cars always discharge to the crusher.

The shuttle cars discharge to a high capacity elevator which elevates the ore approximately 12 ft to discharge into the top of the portable, 36 by 54-in., single roll crusher. The crusher base is elevated approximately 3½ ft above the mine floor on heavy pedestals which straddle the 30-in. belt conveyor on which the ore is transported to the shaft bottom pocket. After passing through the crusher, which crushes to minus five-in. size, the ore discharges directly to the conveyor which travels at a speed of 440 fpm and is capable of handling 550 tph.

Shuttle cars and semi-portable crusher speed up operations

Since there is no track in the mine, novel problems of handling men and material were presented. These problems were solved initially by the use of battery powered jeeps pulling powder and supply trailers and also hauling production equipment from place to place. A further improvement of this phase of the operation is the installation of several Willys four-wheel drive jeeps powered by four cylinder Diesel engines. These units are used for the same purposes as the battery jeeps, but perform at faster speeds and have considerably more power. They are also used to provide fast supervisory transportation. On order, but not yet put in operation, is a Dodge Power Wagon equipped with a six-cylinder Diesel engine which is expected to further improve the supply and equipment transfer operation.

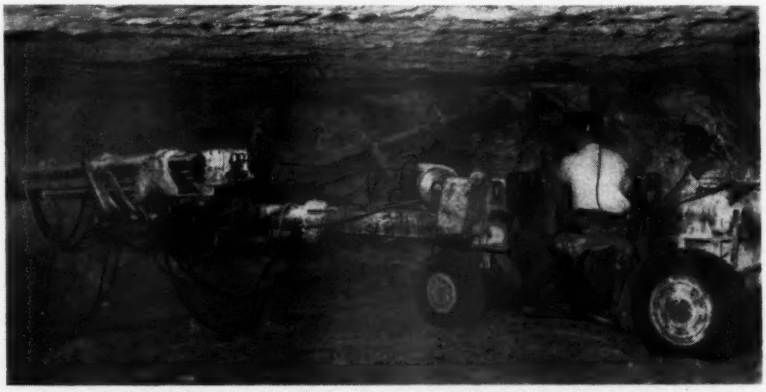
B. Diesel-electric Locomotives

The United States Potash Co. is currently completing their new No. 3 Shaft in a new mining area several miles northeast of their No. 1 Haulage Shaft. A new 40-ton Diesel-electric locomotive for main line haulage will be put in operation to take ore mined in this new area back to their No. 1 Shaft. This locomotive is 46 ft 4-in. over-all in length and has a height above the rails of six ft. Normal engine rating with scrubber is 420 bhp with a total input to the generator for traction of 370 hp at 2100 rpm. Tractive effort at 30 percent adhesion is 24,000 lb. Maximum permissible speed is 30 mph. The locomotive is equipped with one Diesel engine, one generator, and four traction motors. It has a two-station control and is equipped with air brakes.

The haulage distance will be about six miles one way. Automatic bottom dump mine cars of approximately 10 tons capacity will be used. These cars are fitted with Willison type automatic couplers. The use of the Diesel locomotive eliminates the necessity of d.c. conversion and distribution equipment for locomotive haulage.

C. Electric Locomotives

Several of the mines are using two 15-ton or two 20-ton locomotives operated either as single units or in separable tandem on main line haulage. These locomotives are designed with plug-in type controls so that one operator and one pole can be used to control both locomotives. This gives



A rubber tired drilling jumbo takes a lot of the backache out of the driller's work

maximum flexibility where it is required to operate both units separately or in tandem. Where heavy loads are brought down steep grades, two 20-ton locomotives are used with automatic current limiting dynamic braking. International had a severe braking problem in the 12 North section of their potash mine at Carlsbad. The haulage system has a 3000-ft section with an average grade of 6 percent and a maximum grade of 7.81 percent for approximately 400 ft. At the bottom of the grade, it is necessary to execute a 90° turn. The grade is with the loaded train and production requirements make it necessary to run 12-car trains downgrade. It is necessary that braking speeds downgrade be held low enough to permit a train to safely negotiate the 90° turn at the bottom of the grade.

By the use of automatic selective current limiting dynamic braking, the locomotives can be held to a safe speed at all times on the grade to operate well within the limits of the locomotive's handling 12 cars with considerable capacity for additional braking under the control of the operator. With two 20-ton locomotives coupled to 12 loaded cars, each car weighing nine tons loaded, the coefficient of adhesion on clean, dry rail at the hauling speed of five mph on the 6 percent grade is approximately 20 percent, and on the 7.81 percent grade is approximately 28 percent. Dynamic braking is automatically applied at the top of the hill by a limit switch attached to the bottom of the locomotive which rides over a ramp located at the side of the rail both at the top and bottom of the grade.

How Speed Is Controlled

As a locomotive enters the grade, the limit switches pass over the projecting ramps, closing contacts in the switch. The change-over relay operates to open the control circuit to all power switches, disconnecting the motors from the trolley and closing the control circuit to the dynamic braking switches. This causes the motors to be connected for dynamic braking under control of the current limit relay. The dynamic braking switches will close in sequence until the dynamic braking current reaches a value which will open the current limit relay. When the current limit relay contacts open, the progression of closing braking switches is arrested. This value of current is greater than that necessary to hold a fixed speed on the grade, but is less than that which will provide enough braking effort to lock the wheels. Consequently, the locomotive will slow down and the braking current will increase. At the point where the braking current decreases below that current which was necessary to open the current limit relays, the relays will close again and the next braking switch will close. This action continues to a predetermined point where the train speed is considered safe. The locomotive continues down the grade on this braking point until the limit switch contacts the projecting ramp at the bottom of the grade. This action de-energizes the change-over relay and the locomotive operator can take over control of the locomotive by returning the controller main handle to the "Off" position and then operating the controller in the regular manner.

In addition to current limit operation while braking, these locomotives also accelerate under supervision of the current limit relay. Movement of the main control handle from the "Off" position to the "Full On" position does not apply line voltage to the motors since the current limit relay prevents closure of the accelerating switches until the current is of the proper magnitude for each switching point. The braking resistor is also used for accelerating duty.

D. Mine Cars and Mantrip Cars

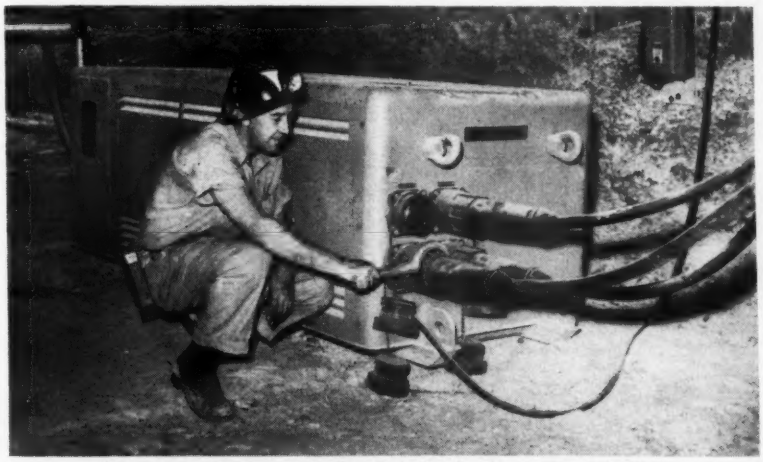
Southwest Potash Corporation has installed mine cars of 16-ton capacity, 42 in. high, 78 in. wide, 22 ft 6 in. long, weighing 5.4 tons empty with 48-in. gage for main haulage to the shaft bottom. The cars are mounted on two four-wheel trucks similar to surface railroad freight cars. They are equipped with automatic couplers.

To obtain fast, safe transportation of men, this company has also installed special mantrip cars 43 in. high, 78 in. wide, 22 ft 6 in. long with a capacity of 40 men comfortably seated under a protective roof.

Electrical Distribution

A. Main Feeders and Substations

Stepped-up production underground has thrown quite a burden on the existing 2300 v. alternating current primary power distribution systems. Duval Sulphur and Potash Co. and Southwest Potash Corp. put in 4160 v., four-wire systems in their mines when they went into operation. International also installed a 4160 v. distribution system in its extension to the present ore body. The older properties, Potash Co. of America and United States Potash Co., did not find it feasible to change their 2300 v. systems. The United States Potash Co. decided to use a 12,470 v. primary system and has initiated the first step in converting over to this system. They have lowered and connected a 15 kv cable in their shaft. It is neoprene-jacketed, three-conductor, Type G cable with copper shielding tapes and semi-conducting tape around the conductor insulation. The cable feeds their first high voltage mine power center which is a 750 kva unit substation specially designed to be dismantled in the field in order to go down their 44-in. by 64-in. shaft. The transformer is designed so that it can be tipped over and hauled on its side, which is necessary for moving from point to point in the mine. Consideration had to be given in this type of design to eliminate damage to internal coil structure. This substation has a 12,470 v./2300 v. transformer. The 2300 v. feeders radiate from this substation to the smaller existing substations in the working faces for a further step down to 230 v. for secondary power on equipment.



Mine power centers supply the electricity for the many mechanized tasks underground

The system at Potash Company of America is essentially a 2300 v. to 230 v. system. In one of the new working areas located at some distance from their main haulage shaft, they have put in an overhead 12,470 v. hi-line and have dropped a 15 kv feeder cable to the bottom of their new shaft. At this point, the 12,470 v. circuit is transformed to 2300 v. to connect into the existing 2300 v. distribution system in this area.

In the area in which the continuous miners are used, 2300 v. to 480 v., three-phase transformers are used to

furnish power for these machines. Each mine power centers is rated at 450 kva. In all other sections, 230 v. circuits are used in the faces.

Southwest Potash Corp. has installed switch houses at the end of their shaft cable. Mine feeders which are three-conductor, 4/0, 5 kv mine power cables, radiate from these switch houses to mine power centers located near the working faces. These mine power centers are rated at 112½ kva. Each mine power center will accommodate a loading machine, a loading elevator, a car puller, and a Jumbo drill. A tap is made on the load side of the switch house and a circuit is run to a 50 kw portable selenium rectifier. These rectifiers furnish power for three shuttle cars. The shuttle cars move material from the working face to the loading elevator located at the transfer point.

amp, 50 ohm resistor. The three conductors of the cable are arranged to go through a doughnut-type transformer. A two-six-amp., Type CO relay is connected in the current transformer circuit to measure ground currents. The current transformer has a ratio of 25/5 amps so that a ground current of 20 amps flowing would mean 4 amps in the ground relay circuit which would trip the CO relay. A normal 10 amp ground current would result in only two amps in the relay circuit, so no operation would result. This method gives maximum protection from ground faults in the 4160 v. primary distribution system. The leakage reactance of the doughnut-type transformer is not exactly the same for all three phase conductors, which gives rise to a small voltage induced in the secondary when there is no ground fault. However, this effect is so small that it does not present an operating difficulty.

This latter day hoistman has a clear view of the top of the shaft and visible evidence of what is happening all the way down

Both Duval and International have installed neoprene-jacketed, three-conductor, 5 kv, Type G shaft cables operating at 4160 v. The cables terminate in switchgear containing oil circuit breakers rated at 600 amps with 100,000 kva interrupting capacity. Mine power feeder cables radiate from the switchgear to mine power centers located at the faces.

International has installed a 12,470 v. hi-line to their No. 3 Shaft at which point a 2500 kva transformer was installed to transform voltage down to 4160 v. Two secondary breaker cubicles were installed. One connects 4160 v. to another hi-line for power for No. 4 Shaft area located approximately 8500 ft from No. 3 Shaft. The other breaker feeds power down the No. 3 Shaft to the switchgear located at the bottom of the shaft.

For protection, the secondary or 4160 v. side of this 2500 kva transformer is connected in wye with a neutral point grounded through a 50

B. Power Centers and Rectifiers

All of the mines are using low-head mine power centers. The three popular sizes are 112½, 225, and 300 kva. The 450 kva power center is used by Potash Company of America for continuous miners. These mine power centers are of non-explosive, fire resistant, air insulated, dry type construction. Neutral points for protective grounding systems are established through the use of zig-zag transformers. Resistors are used to limit ground current under fault conditions to five. These mine power centers are skid-mounted and are highly portable.

Rectifiers for dc power are becoming standard in the Basin. Selenium rectifiers are being used in the working faces for the shuttle cars and 200 and 300 kw ignitron tube rectifier sets are used for main line haulage. At the older properties, some motor-generator sets are still in use on main line haulage and have been augmented by the use of ignitron tube rectifiers.

On main line haulage, the usual practice is to use 6/0 trolley wire paralleled by 500,000 circular mill feeders. On gathering lines, 4/0 trolley is usually paralleled with 250,000 circular mill feeders. In most of the mines, bonded and cross-bonded rail is used. The new extension to International's 900-ft Level 15,000-ft long main line haulage has thermit welded 75-lb rail cross-bonded every 400 ft. Two 20-ton, 275 v., dc locomotives in tandem are used on this run.

Hoisting

A. Automatic Hoists

Both Duval and Southwest put automatic hoists into operation when they began production. Several years ago, Potash Company of America and International introduced automatic hoisting. The most recent development in the Basin is the new remotely controlled automatic hoist put in at International. This hoist has two 800 hp dc motors driven from a 1750 hp synchronous motor-generator set. The outstanding feature about this hoist is the remote operating station located at the collar of the shaft. A desk-type console is provided for the hoist operator on which are located micro-depth indicators, a master switch for manual operation, and other devices required for operation of the hoist. The hoistman sits in clear view of the shaft collar. A graduated-type air braking system is provided in the console so that the operator has complete braking control of the hoist. An intercommunication system is provided to connect the mine, crushing plant, and refinery with the hoistman.

B. Skips

The new combination skips and cages at International are rubber-tired and similar to those in use at Southwest Potash Corporation. However, because of headroom requirements, the cage at International is an integral part of the skip. The floor hinges back to provide an opening for the skip loader. For protection in the bottom in case the floor is left down, a limit switch is provided ahead of the skip loader to prevent the skip from going into the bottom with the floor down. This provides a man safety feature to the hoist. A selector switch is also provided on the console for "Automatic," "Manual," "Off," and "Man Safety" positions. During the hoisting of men, the man safety circuit is used which does not permit the hoistman to go beyond the collar or the 900-ft Level.

C. Equipment Compartment

At Southwest Potash Corp., the main shaft has been divided into halves with a concrete curtain wall.

(Continued on page 105)

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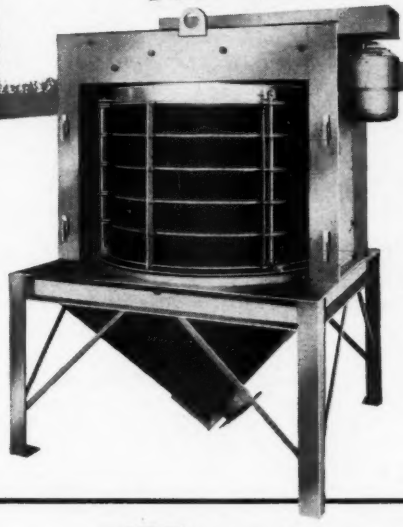

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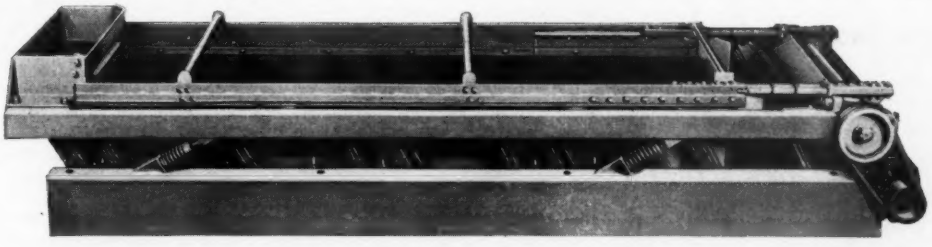

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S154

An aerial view of a Northern Illinois Coal Corp. washer. Notice the pipe line discharging refuse into the large settling pool on the left

Reject Disposal

Midwest Coal Company Handles 203,000 Tons of Reject a Year with Pumps at One Mine at a Cost of 2.6 Cents Per Ton

By W. A. WEIMER
Chief Engineer
Northern Illinois Coal Corp.

REFUSE disposal is too often neglected. Not only is it a non-profitable operation, but it is a costly one. The very fact that it is neglected makes it more expensive in the long run.

Reject from the modern coal washer is a sloppy, water-retaining material. As higher-ash seams are mined, the problem of refuse disposal grows, because of the greater quantity handled and also because it must be moved further to disposal areas.

The disposal of washer refuse by trucking from the washer is not usually completed by truck haulage alone. Waterborne sludge as slurry cannot be readily separated from waste water—it must either flow or be pumped to a settling basin where the water can drain away. Trucks can haul the 6-in. by ¼-in. or 4-in. by ½-in. sizes, but are unable to handle the lower by zero sizes. This fraction generally amounts to 30 or 50 percent of the total reject and must be pumped to the settling area, or if the yard topography is suitable it can be flumed away. In all districts care must be exercised to confine both the coarse and fines so that drainage from neither will enter a natural stream.

Disposal Costs Vary

Reject disposal costs vary with conditions. They also vary greatly between truck haulage of the coarse and the pumping of the fines. Following is tabulated tipple data and reject disposal costs for two mines of the Northern Illinois Coal Corp., one in December, 1953, the other in January, 1954.

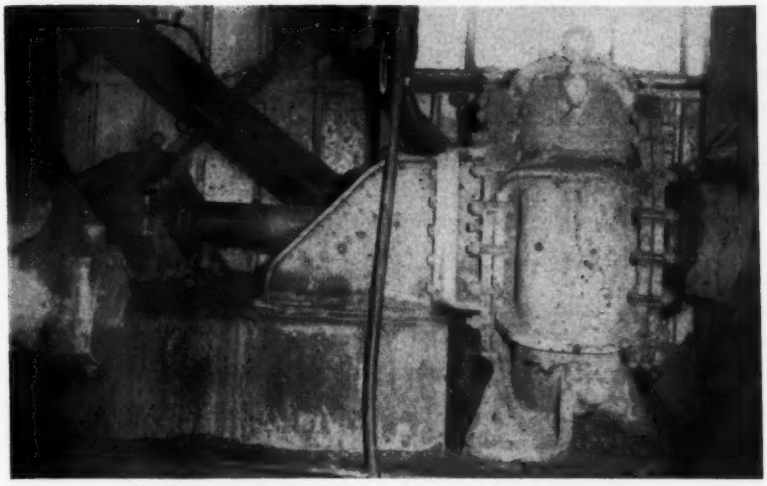
At the S Mine the refuse truck was a four-cu yd dump truck and at the T Mine refuse was hauled by two 12-yd Euclids. Since these two mines hauled almost identical tonnages of coarse refuse an equal distance by trucks that were entirely different, the assumption can be made that coarse refuse will cost $0.14 per ton for the first ½-mile haul. One-half mile should be the length of a typical haul unless the reject is returned to the pit, as often occurs in strip mining. In that case the coal truck haul costs would apply.

In analyzing a reject disposal system of this kind the question is always asked—if slurry pumping is so economical, why not pump all the refuse? The answer is—it can be, and economically too.

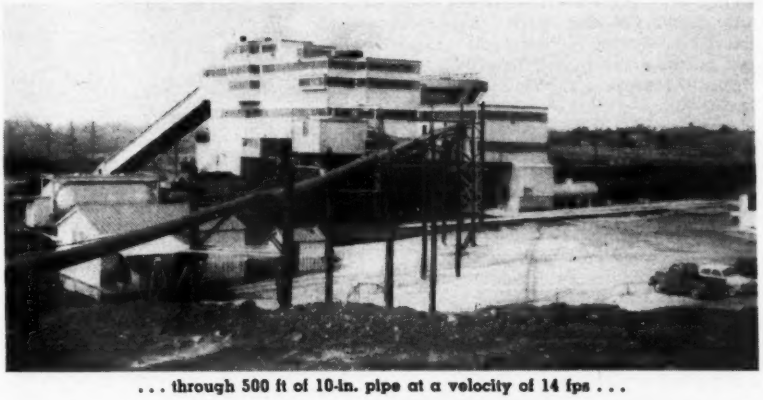
Solids Pumping Not New

Hydraulic transportation of sand, minerals and rock is not new. The cities on the Great Lakes have used "hydraulicing" to extend their lake fronts. The National Government has used this method for a long time to deepen marine and shipping channels.

	S-Mine	T-Mine
R.O.M.	102,249 tons—100%	155,283 tons—100%
Washed Coal	83,026 tons—81.2%	128,717 tons—82.9%
Reject	19,223 tons—18.8%	26,566 tons—17.1%
Coarse Refuse (6"x10M)	14,008 tons— 73%	41,983 tons— 56%
Slurry (10Mx0)	5,215 tons— 27%	11,583 tons— 44%
Refuse Haul Distance	2,500 ft	2,800 ft
Slurry Pump Distance	600 ft	1,500 ft
Trucking Cost	$0.14 per ton	$0.133 per ton
Pumping Cost	$0.015 per ton	$0.051 per ton
Total Refuse Cost	$0.105 per ton	$0.097 per ton



This 10-in. dredge pump forces 150 tph of 6-in. by 0 refuse . . .



. . . through 500 ft of 10-in. pipe at a velocity of 14 fps . . .

Phosphate is now being pumped from pit to concentrating plant in Florida and iron ore is being pumped on the iron range. In the design of newer coal washers fine coal is pumped instead of riding elevators. In some instances, fine coal is transported upwards in pipes without being pumped by using a differential in elevations between a cone and the discharge point of a pipe, the mixture flowing fast enough in the pipe to maintain the needed turbulence and velocity to hold the coal in suspension.

Physical requirements and conditions of coarse (6 in. by 0 or 4 in. by 0) refuse pumping can best be explained by describing an installation of the Northern Illinois Coal Corp. They first began pumping a 4-in. by 0 refuse in the fall of 1940 and continued until the mine was closed in 1952. Before 1940 the refuse was trucked a short distance. Being in a cold climate, there were many troubles—refuse trucks froze between loads, refuse conveyors froze and broke, discharge bin gates froze and had to be kept heated, and the retail yard was a continual loblolly. The washer was shut down frequently due to these delays and it was decided to try pumping all refuse. Fortunately, there was an abandoned strip pit within 500 ft of the washer and a pit of water three miles long and 40 ft deep on the other side. These two pits were connected by a roundabout ditch, forming a 25-acre settling basin and a water recirculation route of six miles.

Coal refuse was 16 percent of the raw coal input. Thirty percent of the refuse was a clay which under-lay the coal seam and was picked up by the loading shovel. Rock and sulfur bands made up the remaining 70 percent. Thirty-eight percent of the refuse was ½ in. by 0; 22 percent 1½ in. by ½ in., and 40 percent 4 in. by 1½ in. in size.

Pump 2½ Million Tons Refuse

Since 1940 more than 2,500,000 tons of this refuse has been pumped and now is piled 60 ft above the ground in an abandoned 40 ft deep pit, for a total gob-pile depth of 100 ft.

A six-in., rubber-lined impellor pump was used for the first five years. This pump gave good service at low heads but, as its speed was increased to overcome and higher heads encountered because of the rising refuse pile, it proved too small. An eight-in. rubber line discharge pipe was installed, but proved to be troublesome. The rubber lining increased the friction head, causing the pump to speed up, and as the lining wore out in spots it separated from the steel pipe and collapsed, blocking the pipe.

The final installation consisted of an eight-in. alloy dredge pump with a 200-hp V-belt connected wound rotor motor having three speeds controlled by a float switch to cut in and out resistances. The refuse collecting tank was six ft in diam by 15 ft high and provided the pump with a flooded suction at all times. Eight-in. Armco spiral dredge pipe carried refuse to the pit 500 ft away. At the outset this pipe discharged into the open pit. The pit is now full and material is piled 60 ft above the surrounding ground. As the pile filled above the natural ground, elaborate plans were made to build levees and fences to direct and confine the refuse. At the discharge end of the pipe screens and troughs were tried to separate the sizes to aid the flow of the fines and

. . . to a 35-acre settling pool. Note the built-up dike in the background and the rapid settling out of the larger sizes

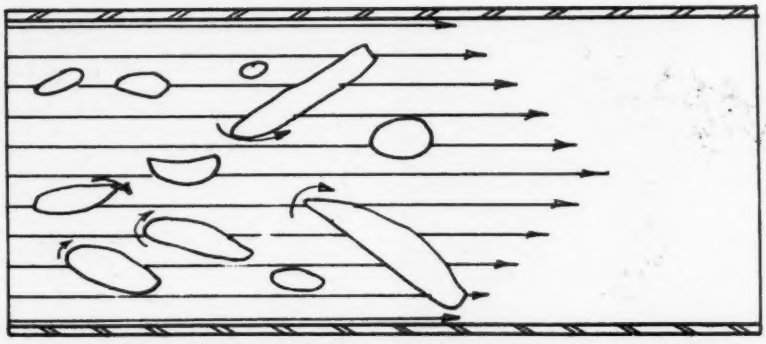


Fig. 1—Vertical components of turbulent currents play an important part in keeping solids in suspension

water from the coarse particles. All plans and fears were needless, however, as the discharge pile is a natural sizing medium, permitting the heavier solids to settle in place and the lighter, finer sizes to flow away with the water. The decreasingly smaller particles are carried further by the action of flow of the water until at a distance of 1000 ft from the discharge only very fine soluble clay remains in suspension. A tractor bulldozer worked a small percent of its time on this pile to build the confining levee of the coarse material as far as 500 ft from the discharge pipe. Beyond 500 ft, from the discharge end, an earth levee, 15 ft high, was built around the 25-acre pool to direct the flow into the recirculation ditch.

The pump ran at a rate of from 580 to 680 rpm in three speed steps activated by a float switch and resistance connected to the wound rotor motor. It handled 110 tph of refuse containing 15 percent solids and used 2500 gpm of water at a velocity of 16½ ft per second. This velocity was too fast but that amount of water needed to be wasted.

Maintenance, consisting of parts and labor and electrical power, totalled 2.6 cents per ton for the disposal of 203,000 tons of reject in 1950.

During 1951 the company constructed a pumping disposal system at its Tecumseh Mine in Southern Indiana in which all of the reject was pumped 500 ft to a 35-acre settling pool. This reject had a six-in. top size, and was handled at the rate of 150 tph in 3500 gpm of water against a static head of 30 ft. It was pumped by a 10-in. dredge pump through a 10-in. line at a velocity of 14 fps. A 200-hp motor was V-belt connected to the pump and used 110 hp for this service. The extra power was provided for use when the refuse pile became higher and the pump would be working against a higher head.

The two installations described worked very well and handled many thousands of tons of refuse in a trouble-free system. Some pipe blockage was experienced in the later installation due to a concentration of solids in the system when the washer was started for a shift's run. The washing system required extra water then, leaving less for the reject pumping system. As the mixture level lowered in the refuse sump tank, it slowed the pump until the velocity of mixture in the discharge pipe was too low to carry the solids which then settled out to plug the pipe. This was corrected by stopping the refuse conveyor to the pump until the water had again started to rise in the sump.

Because of the experience with pipe blocks when using a variable speed motor on the refuse pump, it was decided to use a constant speed induction motor on the next installations. This was done on the system built into the new Lynnville Mine washer of the company. The water added to the refuse sump tank to maintain a constant range is controlled by a motorized valve. This makes the refuse control system independent of the washer water fluctuations.

Use Large Settling Pools

At these installations it will be noted that the refuse settling pools are 25, 35 and 55 acres in area and capable of receiving reject to be stacked many feet high. The carrying water drains away and is recirculated to the fresh water reservoir for washer use again, thus creating a closed system of water and refuse control. During the drought years of 1952 and 1953 this water conservation was of material advantage.

The hydraulic properties of pumping solids have so many variables that each adaption is a problem in itself. Where experimental data or usages are available for any particular material they should be used in preference to empirical data. Each installation of a solids pumping system, is a problem to be solved, not only by engineering design, but also by cut-and-try methods. A 4-in. by 0 refuse will have a specific gravity range of 2.35 to 2.45, with 2.4 as a general average. In pumping this size, 18 to 20 percent of the mixture should be dry solids by weight. When these solids are added to the water to make a solution, 0.1 of the volume of the mixture will be refuse. This will result in a mixture specific gravity of 1.13. To keep the larger pieces of heavy rock in the mixture from settling and grouping in the horizontal pipe, thus causing a plug, it is necessary to provide enough turbulence to prevent settling.

One way to hinder settling is to add fines, increasing the specific gravity; another way is to move the mixture faster in the pipe, increasing turbulence. The suspension of solids in the pipe stream, which makes their conveyance possible, is due primarily to the vertical components of turbulent currents and to the rotation of the particles caused by variations in velocity in the cross sections of the pipe. This is illustrated in Fig. 1. If the solids settle and block a pipe line, either the turbulence created by the velocity or the relative density which affects the settling must be increased.

The most important hydraulic factor in pumping solids is the correct velocity of the mixture in the pipe. This is, of course, the lowest velocity under fluctuating conditions that will carry the solids along and will be the most economical in water requirement and power demand. The velocity at which solids can be moved most efficiently can best be determined by experiment. This critical velocity depends upon the size, specific gravity, shape and nature of the solids; the percentage by weight carried, and the condition of the pipe—its diameter and its pitch. From experience it has been found by Northern Illinois Coal Corp. personnel that 4-in. by 0 coal refuse should have a velocity of 12 to 14 fps. This is the lowest and most economical speed for a mixture of this nature.

Sample Problem

A typical problem solving the requirements for a refuse installation will be interesting. Suppose the specific gravity of the dry refuse, the specific gravity of the mixture, the economical velocity of the mixture in the pipe, the percent by weight of the dry solids in the water and the approximate pipe size have been determined. Then, if there are 100 tph of washer reject, what are the requirements for pumping this to disposal, as shown in Figs. 2 and 3.

Assume that you wished to install a refuse pumping system and had the following data:

Given:

- 11 tph of 4-in. by 0 coal refuse
- 20 percent of mixture to be dry solids by weight
- 2.4 specific gravity of dry solids
- 1.13 specific gravity of mixture
- 12 fps—velocity of mixture in pipe
- 500 ft of eight-in. pipe with three 90° bends
- 40 ft vertical rise of discharge pipe

Then determine:

Gpm of water needed

Discharge pipe size (Check—important!)
Pump size and speed
Motor size
Cost of installation and operation

The first thing to find is the quantity of water necessary to carry the solids. Then the pump size and pipe diameter can be figured.

If 20 percent by weight of the mixture is to be solids, then the balance must be water. To dilute 100 tph of refuse would therefore require 400 tph of water or 1600 gpm.

The volume of 100 tph of the refuse with a 2.4 sp.q. equals 167 gpm which, when added to the 1600 gpm of water needed, totals 1767 gpm. This is the amount of slurry the pump will have to handle. An eight-in. pipe will allow 1767 gpm to flow at a rate slightly faster than 12 fps, the minimum speed for coarse refuse found by experience to be safe and economical.

Next comes the determination of the proper pump and driving motor for the duty outlined above. To do this the various pressure losses have to be calculated. Pumping 1767 gpm of slurry through an eight-in. pipe creates a friction loss of nine ft of head for every 100 ft of pipe length. Three eight-in., 90° long radius elbows have a friction loss, each equal to 21 ft of straight pipe or a total of 63 ft. This added to the 500 ft of straight pipe gives an equivalent pipe length of 563 ft. If for every 100 ft of equivalent straight pipe there is a friction loss of nine ft, the total friction head to overcome is 51 ft. Adding the 40-ft static head gives a Total Dynamic Head (TDH) of 91 ft for the pump and motor to handle.

From the Morris Machine Works dredge pump tables can be selected on 8-in. by 9-in. pump, running at 640 to 730 rpm to overcome a 90-ft TDH. The pump would require 9.2 hp for every 10 ft of lift. For the installation outlined, 83.8 hp would be required and a 100-hp motor selected.

Next estimate the cost of the system to handle 100 tph of refuse through 500 ft of eight-in. pipe.

In the above estimate, a wound rotor motor with float switch and resistance speed controls have been used. An induction motor with a vari-pitch V-belt drive could be used at a lower cost if other conditions permitted.

1—Eight-in. Dredge Pump 1—100 hp Wound Rotor Motor 1—Item Electric Starter and Speed Controls	$7,735.00
1—Refuse Tank (6 ft diam by 15 ft high by ½ in. Rate)	800.00
Foundations	750.00
500 lin. ft eight in. OD Dredge Pipe	965.00
3—90° eight in. Long Radius Pipe Elbows	350.00
1—Recirculating Pumping Unit to Furnish 1000 gpm Added Water	2,000.00
Total	$12,600.00
Contingencies 10 percent	1,260.00
Total Estimate	$13,860.00

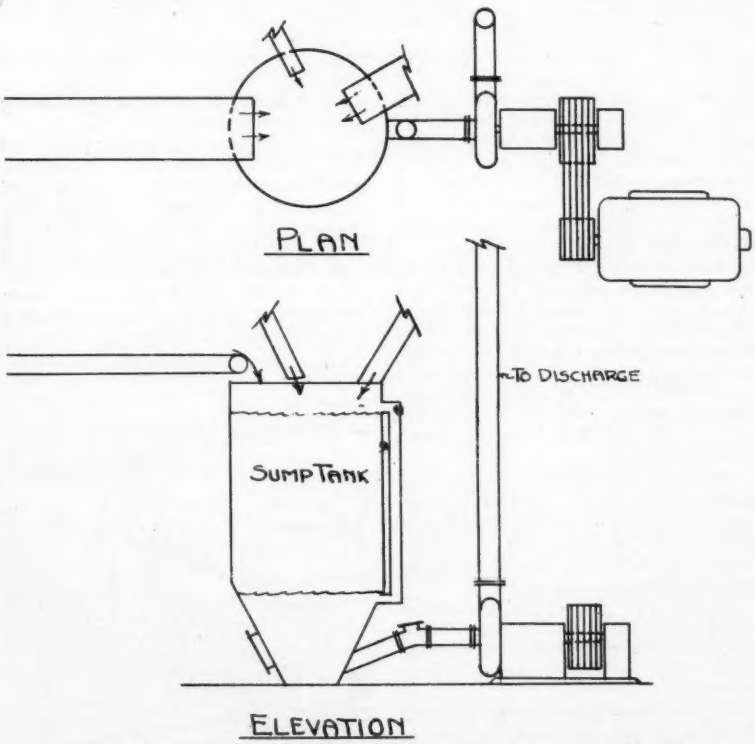


Fig. 2—One method of collecting refuse before pumping it to disposal

And, if enough wash water is available, the circulation water pump can be eliminated. However, refuse pumping, especially coarse refuse, may require more water than the ordinary washer uses. This water can be recirculated in the reservoir so that it will not be lost.

Operating Costs

A low operating and maintenance cost and the fact that this is an automatic installation not requiring the presence of an attendant is the noticeable advantage of the above system. Operating and maintenance costs are low in comparison with any disposal method. This can be shown by using the foregoing proposed installation and cost experience of the Northern Illinois Coal Corp.

One Flintalloy pump impeller, shaft and fittings, will pump 200,000 tons of refuse and costs $800 installed—or $0.004 per ton. One pump casing shell will pump 400,000 tons before renewal and costs $800 installed—or $0.002 per ton. The discharge pipe line, if rotated to three positions for wear distribution during its life, will pump 100,000 tons refuse and costs $1,200 in place—or $0.012 per ton. Total maintenance replacement cost, therefore, add up to $0.018 per ton for refuse handled. As a comparison, at the Northern mine of Northern Illinois Coal Corp., $750 was spent for parts in addition to an estimated labor charge of $300 for a total of $1,250 during 1949. The refuse pumped amounted to 167,570 tons for a cost of $0.0075 per ton for maintenance.

Fower operating costs are different at each of the Northern Illinois Coal Corp's mines and it suggested that an energy cost of $0.0125 per kw hour be assumed. Using this power rate to calculate the power costs for the proposed 100-hp installation, gives a cost of $0.008 per ton for power.

Adding the $0.018 per ton maintenance charge and the $0.008 per ton power charges gives a total pumping cost per ton of $0.026.

The proposed system will transport refuse to a disposal area 500 ft from the tipple. In case the area was 1500 ft from the tipple, an additional charge of $0.013 per ton for power and maintenance would have to be added, giving a cost of $0.039 per ton for refuse to be pumped 1500 ft. This 1500-ft dis-

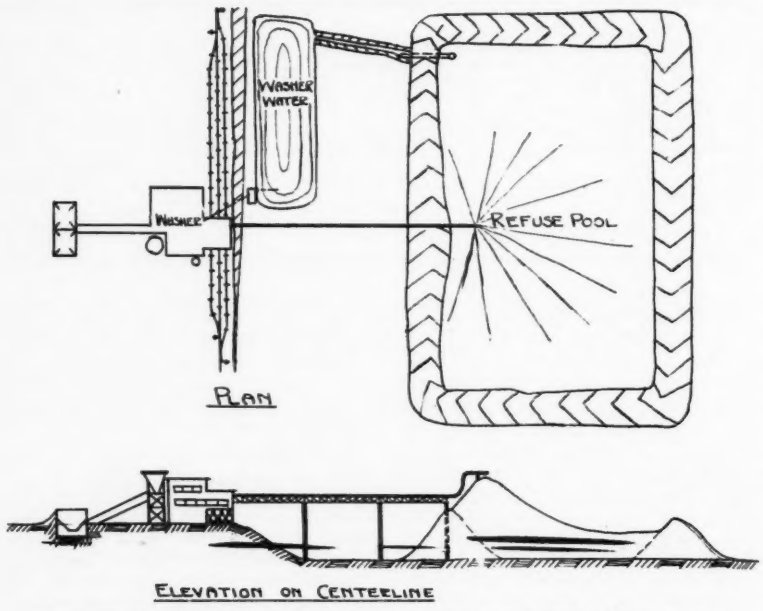


Fig. 3—Sketch of hypothetical refuse disposal system for handling 100 tph of refuse. See text for analysis and cost estimate

tance, with a 40-ft rise, is the maximum length that can be handled by one pump. An identical pump could be installed in series, side by side, or at the discharge end of the 1500-ft pipe to stretch the pumping distance another 2000 ft, for a total of 3500 ft with a two-pump system.

Design of refuse pumping systems differs from design of dredging systems in that a definite amount of solids is available and the carrying water is limited. The reverse is true in dredging operations. These facts impart certain beneficial restrictions and allow the designer to build a more efficient and economical refuse disposal system. Concentration of solids can be increased and the velocity slowed so that perhaps the next smaller size pump and pipe can be used. Other economy might be had by crushing the solids to a smaller size, thereby recovering additional coal and permitting the carrying water to contain a greater percent of solids and possibly eliminate the need of adding additional water to the system.

Generally Need More Water

Additional water is usually required for a refuse pumping system. Strip mine washers use water in a range of 1½ to 2 gpm for every ton per hour of coal washed. Thus a 500-tph washer will use 800 gpm of wash water, and have 100 tph of refuse. The refuse disposal system will require 1200 to 1600 gpm of water to carry the refuse away. Many economies can be achieved by varying washer design, such as reject crushing, screening out very large sizes of rock that can be hauled once a shift, smaller pump, and higher velocity in the pipe and making other allowances for the hydraulic variables that must be satisfied for an efficient and economical system.

Reject disposal needs attention; more attention than washer manufacturers can give. The extent of any method of disposal goes beyond the immediate tipple surroundings and calls for ingenuity in the layout of the yards and water supply system. However, the economies that can be realized through good design will repay efforts many times in the life of a mine.

Young Engineers

(Continued from page 59)

to freshman engineering students the advantages of engineering in the mining and metallurgical fields. Pamphlets such as "Careers in the Mineral Industries" should get proper circulation among engineering freshmen. We should consider making a movie, such as suggested by Dr. Van Pelt, showing the work of mining and metallurgical engineers and geologists to be shown principally in engineering schools, but also in high schools for their vocational guidance programs.

The job of increasing the supply of engineers generally and of taking steps to see that the mining industry gets its share of engineering graduates is important enough for the stimulus of top management attention.

In the Meantime

Whatever results we in the mining industry can achieve toward increasing the number of engineering graduates and the number who are qualified to enter the mining industry, such results cannot possibly help us very much before 1958 as the students for the earlier classes are already in college. We can, of course, begin that part of our program which involves publicizing mining and metallurgy to the present engineering freshman and sophomores, but our success in that endeavor will be limited by the number of students we have to work with.

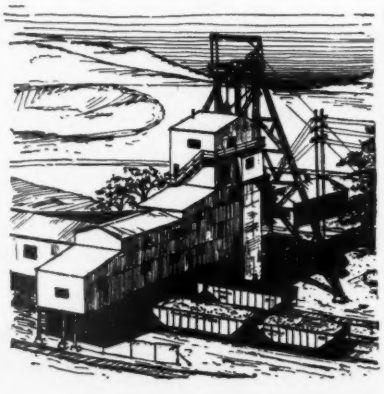
In the meantime the third part of our suggested program for relieving the engineering shortage must of necessity be to improve the utilization of the engineers which we now have in our companies. Experienced engineers must be freed from non-engineering details. While this is not without difficulties and complications, it can be done.

(1) It is essential that we give the young engineers the necessary practical experience as quickly as possible and we must be careful that we do not keep capable young engineers in interne positions too long.

(2) We can and should encourage young employes to study engineering at night, promising them advancement when they have completed their courses.

(3) We should encourage selected engineers to take graduate training to increase their value to our operations and we should assist them in financing such graduate study.

(4) Engineers and professional men have had many complaints in the past, particularly concerning their lack of status, their isolation and their lack of information about the company, its plans and management thinking. It isn't necessary for engineers to continue to work for a company whose personnel policies toward engineers are antiquated or haphazard.



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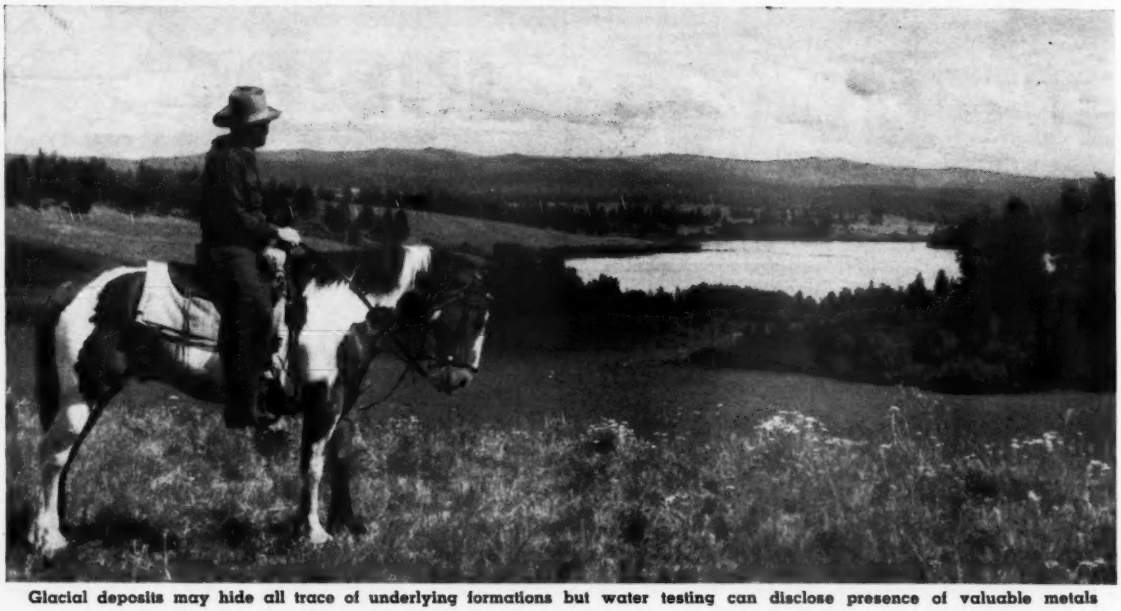

Glacial deposits may hide all trace of underlying formations but water testing can disclose presence of valuable metals

Water Testing in Geochemical Prospecting

Another Tool for the Prospector Provides an Extra Chance to Find a Mine

By H. V. WARREN
and
R. E. DELAVAULT
Department of Geology and Geography
University of British Columbia

MOST laymen and even many professional miners tend to think of the prospector of today as being merely a motorized and mechanized version of the pick-axe and burro itinerant gold digger of the last century. This concept may have some justification, in the occasional areas that can be reached without undue toil from a base which can be serviced by "jeep," plane, or helicopter. In the main localities such as these have been well combed for many years. In them prospecting is now confined to searching for those metals which held no economic interest until recently. In relatively accessible areas the chances of finding a big outcrop, which has been overlooked, are small. Much of the exploration prospecting of today is concentrated on areas without roads, with few or no trails and where air access may be vital. In such areas it is difficult, if not impossible, to make detailed examinations because "the going" is apt to be too difficult. The land may be flat and a substantial part covered by muskeg or by a thick growth of alders. If the land be rugged long detours may be needed to reach any interesting feature. Where a locality has been logged, the presence of trails and roads would seem to offer ready means of access. On the other hand, this possible advantage is often more than counterbalanced by the incredible tangle of fallen trees which may have been left behind.

It is not enough for an energetic man merely to consider some system of traversing the country with his eyes open for any aspect of the scenery which may suggest a favorable geological feature, or for a rock or mineral which may merit investigation. Furthermore not only geography seems to conspire against prospecting: geology adds handicaps. Large areas of North America are covered with variable thicknesses of glacial drift and the pattern of erosion in this drift may have little or no relationship to some of the important geological features of the underlying rock. Under such circumstances it is normal for there to be no detailed geological information available. Even more crippling, especially to the geologically-minded prospector, there is apt to be no knowledge even of the general structure.

To cope with situations such as those the authors have endeavored to develop geochemical methods to the point where they can provide prospectors with the means to select a suitable starting place in the never-ending search for evidence of mineralization.

"Pathfinders" Aid Search

Fortunately most ore deposits even though they may be of relatively small dimensions do actually provide a large target for the person who seeks them.

Metal deposition in a rock is not necessarily strictly localized. An orebody may be surrounded by a genetic

halo. This may consist of minor amounts of the ore metals, or of varying concentrations of one or more elements not of value for themselves but useful because of their association with the metal being sought: these latter elements we speak of as being pathfinder elements. Among the more useful pathfinder elements so far encountered are boron for lead, zinc, and copper; magnesium for zinc and copper; molybdenum for copper; tin for indium; and manganese for epithermal gold. This genetic halo may effectively enlarge the target area.

Dispersion Halo Helps Too

Fortunately another halo, usually referred to as a dispersion halo, also may be of assistance to the prospector. A mineral deposit may be subjected to weathering, mechanical or chemical, or both. Weathering tends to disperse the elements found in an ore body. Many agents are involved in weathering but the most important to a prospector are mineral acids and ground water.

In essence weathering tends to break up an ore body and in one way or another initiates a train of dispersed material. This commences at the original site of the ore and extends towards the sea. This dispersion halo follows natural water courses downstream until it becomes too dispersed or too dilute to be detectable. In the past prospectors have made good use of dispersion trains: running down gold veins or reefs represents one of the oldest and most useful examples.

Other metals can be traced to their source in the same way including mercury, tungsten, tin, and platinum. However, all these deal with mechanical disintegration and are mentioned only to point out that although the term dispersion halo is relatively new, prospectors have been using dispersion haloes ever since prospecting began. Even today streams form good paths for geological exploration, because even in overgrown and drifted areas they often provide evidence in their beds both of the nature of the country rock and of the presence of mineral particles of possible economic interest.

Fortunately dispersion haloes or trains are not restricted to visible particles because even where these are no longer useful, metal ions may still be present in the stream water. Indeed, as long as there is a detectable difference between the "background" amount of a particular metal in water of a given area and any "abnormal" amount of that metal in the water from that same area, all is well for the prospector. The major problem in recent research has been to develop acceptable analytical methods for determining increasingly minute variations from what may be considered the normal metal content of any particular stream.

Water-Testing Methods

Thorolf Vogt demonstrated in Norway, under climatic conditions comparable to those of the Pacific Northwest, that water analyses could lead to mineralized areas and even to actual mineralization. Unfortunately the chemical technique employed by Vogt, although extremely sensitive, depended largely upon making the determination at a definite and accurately maintained temperature. Vogt's analytical operations had to be centralized in a cabin. This drastically reduced the potentialities for using this method of water analysis in preliminary explorations.

Gamma Defined

In reporting the metal content of water the term gamma is commonly used. One gamma (γ) is .001 mg.

The modern prospector considers a kit like this as necessary as beans and flour

and one gamma, or γ, per liter corresponds to 1 part per billion. Occasionally one speaks of water as containing three gammas of copper: this is to be taken as meaning that the water contains three parts of copper to each billion parts of water.

Vogt after collecting samples in the vicinity of a mine during a dry period came to the conclusion that in the area he was studying water contained from 10 to 44 γ of copper. Water passing over a little orebody contained 65 γ of copper. Incidentally Vogt's normal copper contents would be considered very high in most parts of the Pacific Northwest where any natural water containing more than 2 γ of copper usually merits investigation.

Use Dithizone As Reagent

A few years later E. A. Sergeev in U.S.S.R. and L. C. Huff in the U. S. A. using more practical analytical methods demonstrated once again the possibilities of using water testing as a prospecting tool. They used "dithizone," a strongly coloured green organic chemical which turns deep red when it combines with heavy metals. The change in color produced by 0.1 γ of metal in one cc of dilute solution is quite visible. This reagent and its metal complex are both insoluble in water but can be made to react by shaking a solution of dithizone in an organic solvent, itself insoluble in water, with the water to be tested. An appropriate addition of either hydrochloric acid or of acetate buffer brings the water to be tested to a pH suitable for the extraction of copper alone, or of copper and zinc, as circumstances dictate. The organic solution can be separated and treated with dilute ammonia which removes any excess dithizone reagent and leaves the metal-dithizone complex, colored varying shades of red or pink according to the amount of metal present. This method represented a great advance over any previously reported technique. It can still be used profitably where the water which is to be measured contains more than 20 γ of copper or zinc.

Early Work in B. C.

Huff's method naturally appealed greatly to us. The question was whether or not it would work under British Columbian conditions. It was decided to test the then new technique at the property of the Britannia Mining and Smelting Co. Ltd. who have for many years cooperated most generously with the University of British Columbia in many research projects, including our early biogeochemical investigations. Alas, except for the actual water issuing from the mine itself, all the streams, even those passing over obvious mineralization, gave negative results. Whatever the cause, the high rainfall, the slowness of the ore oxidation, or even the extraction of metal from the water by the vegetation, it was immaterial. These conditions could be expected to be repeated in many areas of the Pacific Northwest. It was obvious that if water testing were to be made effective in this area new degrees of sensitivity had to be achieved.

New Method Developed

There is no need to weary the reader with the details of how the necessary improvements were developed to the point where they became capable of detecting in the field not 20 γ but 2 and even 1 γ of copper and zinc in natural water. This has been described in detail elsewhere. This new or "emulsion" technique is still founded on the use of dithizone and merely represents a modest refinement of the procedure described by Huff.

However, it permits a prospector to get results in many areas where heretofore no measurable amounts of metal were obtainable in natural waters.

How Test Works

Briefly the water test is as follows: In order to have the correct pH a few drops of hydrochloric acid or acetate buffer are added to 100 cc. of the water to be tested which has been collected in an open beaker. Then a few drops of dithizone, dissolved in water-soluble acetone, are added. The reaction is instantaneous but the color produced may be too dilute to be visible. The color is "collected" by adding to the solution in the beaker an emulsion of an organic solvent, xylene, quasi insoluble in water, and lighter. The emulsion breaks up in the acid liquid and the resulting minute droplets come slowly to the top of the beaker, having collected both dithizone and dithizone-metal complex on the way. No shaking is necessary and indeed no more mixing is required than that provided by gentle stirring with a glass rod. The amount of dithizone used is measured carefully, preferably by drop counting, and its degree of saturation is determined by observing the color of the xylene droplets at the surface of the liquid in the beaker. If only a very small amount of the dithizone has combined with metal no change of dithizone color will be noted; if the dithizone is saturated with metal it will turn red. If it be about half-saturated green and red mutually neutralize and the bubbles may turn grey, or in a poor light even appear colorless. The grey color is greenish with less metal and purplish with more. Consequently if the same amount of dithizone be used for each test, a scale of colors will be found to correspond to increasing amounts of metal: green, dark green, greenish grey, grey, purplish grey, dark purple, purple, red. Eventually it becomes possible to interpret such a scale in γ per liter—or parts per 1000 million—for a given amount of dithizone used in 100 cc. of natural water.

Actually any attempt at accurate interpretation has little meaning in mountainous areas because of large seasonal and diurnal variations in run off caused by melting snow and vagaries of climate generally. Observations can just as well be expressed in colors in a field note book. As soon as a metal bearing area is detected any local variations of metal content in the water become of secondary importance, relative to other factors such as geology.

Four minutes are sufficient to make a complete water test, even if a couple of minutes are spent waiting for the xylene droplets to climb to the surface. Even less time is needed if one of the newer prospecting kits, such as those available at the British Columbia and Yukon Chamber of Mines, is used. Suitable kits allow rapid water testing even where there is no convenient place on which to lay the equipment, as is often the case in creek beds. In a canoe a test can be made without stopping at all.

First Tried in '49

These new techniques were first tested in the field by a series of investigations carried out in the summer of 1949 in a part of the Nechako watershed. In this area the British Columbia International Engineering Co. Ltd. included among their preliminary investigations a general survey of the mineral possibilities of a portion of the area. This area was very rugged but did contain a number of lakes. These lakes can easily be navigated by small boats and they are fed by large numbers of comparatively short streams whose flow not only varies greatly from season to season but also from day to day, and indeed often from hour to hour. Of even greater value for our purposes was the knowledge of some previously discovered mineralization which, however, had not been extensively developed partly because of difficult communications.

Each creek was tested at its mouth, and eventually upstream if this seemed justified. Streams connected with any known mineralization were tested repeatedly as circumstances dictated. In all places where creeks passed over areas of significant mineralization they gave some evidence of this at or near their mouths. However, and this seemed to us to be significant, in virtually all these creeks blank tests might be encountered if the stream were sampled at an unpropitious time, i.e. after a long period of heavy rain, or a dry period when a metal bearing stream sank into the ground before reaching its mouth where the water came not from the metal bearing tributary but from some non-metal bearing branch.

As a result of the summer's water testing, supplemented in places by plant testing, new mineral occurrences were discovered. Unfortunately this new mineralization was no better than that previously discovered and further exploration did not appear justified. However, with the flooding of large sections of this area and with the consequent much improved transportation conditions it may be that a reassessment of the mineral possibilities of this area will be in order. At all events the summer's work convinced us that new techniques were admirably suited for exploring areas which were badly drift covered and unsuited to traversing in the usual way.

Amounts of metal detected in water was far less than those reported by T. Vogt. The greater part of the water from the coastal ranges of British Columbia comes with little delay from snow melting in the upper reaches of the creeks. Where creeks reach either the ocean or larger bodies of water a positive indication is often no better than three to five γ per liter. Few observations of more than 20 γ have been reported, even where the sampling has been near known mineralization. Conclusions are that although the emulsion technique leaves much to be desired, it is so far the only one which will permit streams carrying from 1 to 20 γ of metal to be effectively prospected by water testing methods.

Later in 1949 during the fall, often the most favorable season for water testing, many more determinations were made in the vicinity of the Britannia Mines. Some of the staff and particularly A. F. Killin, were most helpful. The largest content found coming from known but undisturbed solid mineralized rock was 25 γ per liter. This came from a trickle from a slope just above a mine portal. However, several small streams and rivulets contained from 2 to 4 γ of copper. These would have reported nil by any precious method of testing. Since the fall of 1949 many prospectors have tried out the emulsion technique of water testing. All observations point to the fact that if water testing is to be successful in the Pacific Northwest the tester must count on detecting amounts of metal ranging from one to 10 γ per liter in stream waters.

Limits of Method

Dithizone reacts only with metals belonging to the "long periods" of Mendeleieff's table. Metals with acidic properties—chromium-uranium and vanadium-tantalum columns — do not react: neither do titanium, zirconium, aluminum or magnesium. Tin only reacts in a reduced state, which is unlikely in natural water. Neither iron nor manganese react under the conditions of our test and lead does not easily form soluble compounds. Thus any reaction observed with dithizone in natural water is usually caused by either copper or zinc. Of these two elements zinc is the more commonly observed, even where it has only secondary importance in the mineralization.

Copper mineralization, in at least one instance of economic importance, has been detected not by the copper content of the water but by zinc which can occasionally be detected at a distance from the source where no copper can yet be identified.

Even a small amount of zinc associated with such a mineral as marcasite, which readily yields sulphuric acid on weathering, may travel far and over-advertise what may turn out to be valueless mineralization. Iron is not detected by dithizone in the pres-

ence of acetate buffer and consequently marcasite, pyrrhotite, and pyrite do not give any indication where they are pure. We do not know how nickel bearing pyrrhotite or pentlandite behave but nickel should give good results inasmuch as nickel gives with acetonic dithizone the same reaction as zinc. Similarly cobalt should report in a manner similar to copper. Large amounts of ferric iron in natural water oxidize dithizone and this prevents a reaction being obtained for other metals, the color of the xylene bubbles then turning yellow. This action of ferric iron on dithizone may be unfortunate for an investigating scientist but of course for a prospector this clue, the presence of ferric iron, may be as valuable as any other. Newly melted snow — until it has travelled some distance in a creek, and rainstorm water may also oxidize dithizone. Dr. W. H. White has reported that water testing in the vicinity of the ocean has not given encouraging results. The reason for this is not yet apparent.

Failure of Water to React

Water testing is not infallible. Water coming from mineralization may not show any measurable increase in its metal content. One very simple reason is that mineralized rock does not always yield a measurable amount of metal to water passing over it; either the weathering is not proceeding fast enough or the water is passing by too quickly.

Fortunately much valuable, if not high grade, mineralization occurs in badly shattered ground which provides metal for ground waters. Nevertheless, a prospector need not be too surprised if he fails to detect copper in a small creek which has just passed over a solid body of low,—or even high—grade ore. He may detect the copper 100 yd downstream, probably from nearby mineralization which happens to weather more readily. Whatever the cause, this type of phenomenon must be taken into account.

Metal can be absorbed from water on its way from a deposit. This may happen if the water traverses a marshy area rich in strongly absorbent organic material. Although nothing can be done about this as far as water testing is concerned this absorbent property may indicate use of a biogeochemical tool in place of water testing. Absorption of metal ions by vegetation may be serious in muskeg areas but is not too common in the Pacific Northwest.

Most lake water contains much less metal than might be anticipated. This is probably because much of the metal has been absorbed by plankton or similar microorganisms and is not released during a water test. This problem should not arise in small creeks under the climatic conditions of the Pacific Northwest but it may well be important elsewhere.

Absorption of metal ions by clay particles carried in suspension in water may cause trouble. Unless there is abundant clay in suspension, it does not seem to hinder seriously copper determinations which are made at a rather high acidity; however, it may lower considerably the apparent zinc content of water, especially where the zinc content is low.

Practical Use of Method

Even if comments are restricted to areas of temperate wet climates it is difficult to lay down any set of general rules. Experience suggests that, unless seriously disturbed—by old workings—an undisturbed mineral deposit seldom loses enough metal through weathering to give detectible values in main streams. A simple rule is that not much good can come from testing a stream through which a man cannot wade easily.

A second rule may be suggested. Even if no tributary appears a stream should be sampled at frequent intervals, every quarter of a mile at least, because of the tendency of water to disappear beneath gravel beds and reappear farther downstream. Every small trickle from a bank may be worth testing because the smaller it is the greater is the possibility of its being rich in metal.

A third rule to remember is always to be careful when testing streams in areas of great relief not to test when the water table is liable to have fallen below the zone of oxidation. Metal ions can only get into a stream from an oxidizing ore body where oxidation

(Continued on page 99)

The traditional prospector looked for float along the streams. His modern counterpart tests the stream itself

Trees can, and have, supplied the clue to zinc lying 20 to 30 ft below the surface

MINIMUM CYCLE TIME on this huge shovel—bucket capacity, 45 cubic yards—and other three shovels at mine is accomplished with help of pin-point control of G-E amplidyne system. Dependable G-E motors and motor-generator sets power shovels.

New Ohio coal mine to produce 5

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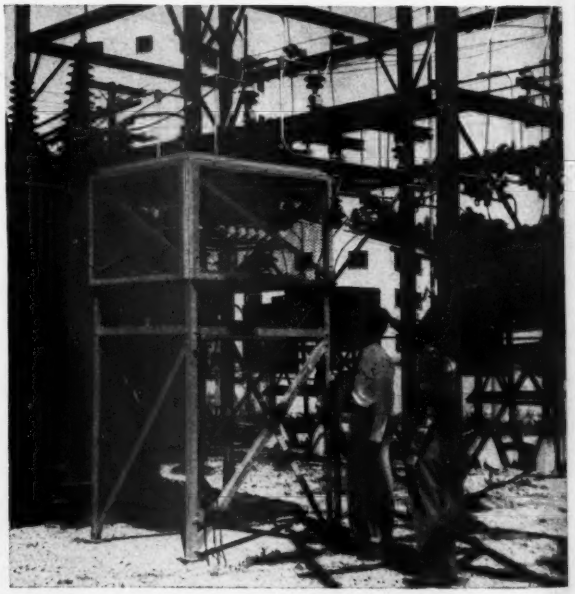

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One Way To Clean A Vertical Pipeline

By E. I. McGEE
Registered Mechanical Engineer
Conneaut, Ohio

ONE coal mining company has used cracked ice to solve, of all things, a serious pumping problem. This company was using three 400-hp and one 500-hp vertical deep-well pumps to move 500 gpm of water out of a 555-ft shaft. The water was of a sulphurous nature and carried an unusual amount of "yellowboy." Shortly after installation of the pumps, tests showed that their efficiency was decreasing. The discharge pipes were removed from the top outlet ell and it was discovered that "yellowboy" had built up to a thickness of one in. on both surfaces of the column. The capacity of the pumps was rapidly decreasing to the point where the mine was endangered.

This called for action, so when the pumps were less than six months out of the factory they had to be removed one at a time, cleaned, and replaced. Each pump took seven men seven shifts to remove; three or four men five shifts to clean; and seven men eight shifts to replace. The cost was about $2000 for each pump. After cleaning, the pumps came right up to their original performance.

But in a few weeks they again began to lose capacity. Chemicals were tried to dissolve the "yellowboy" or prevent its formation to no avail. High-pressure water jets worked only at the top. Long hoses with right angled cross jets helped some, but became snarled with the spiders which were placed at 50-ft intervals to stabilize the inner tube with the numerous shaft bearings. The time was rapidly approaching when the pumps would have to be pulled again.

Then came the simple answer. One of the men concerned with the project made the statement that one thing was certain, if you dropped some gravel and small shale down the column, that would break the mud loose. Of course the pump would never start again, but it put another man to thinking. After thinking about it over-night he suggested that cracked ice be dropped down the column. It could do no harm as it would rapidly melt in the 60° mine water. It did not take long to realize the virtue of the suggestion, and a ton of ice was ordered from a nearby ice plant. After being crushed to about ice cube size, 100 lb or so was dropped down a column while the pump was stopped. The pump was started and it was evident immediately that the plan had worked—material that flowed out of the pump would hardly flow down the flume it was so thick. Several doses, totaling about 600 lb of ice, cleaned the pump column to the point that the pump was again operating at capacity.

Since that experience, the company has "iced" each pump every few weeks, and thereby kept them up to top efficiency at very little expense and no down time.

How To Align A Shaking Table Deck

By D. N. GRIFFIN
Vice-President
The Deister Concentrator Co.

WHEN properly installed, coal-washing tables of the diagonal-deck type require little attendance and produce excellent results. However, periodic checking of deck alignment, say at six-month intervals, helps insure optimum performance.

First, it is assumed that the main frame was properly installed so deck alignment is parallel to the line of motion. Alignment of the deck along the long diagonal from the feed-box corner to the middling box corner can easily be checked by using three machine nuts of equal thickness and a chalk line. One of the nuts is placed on the deck cover immediately above the tilting post at the feed corner. A second is similarly placed immediately over the tilting post at the middling corner. The chalk line is stretched tightly over the tops of these two nuts. Care should be taken that both nuts are firmly against the cover and that the chalk line is completely free. The third nut is then slipped under the chalk line at a point midway along the chalk line. If the deck is correctly aligned, the chalk line will barely strike the top of the middle nut.

Any adjustment that may be required will be easily seen from the relation between the middle nut and the chalk line. It can be made by shiming between the tilting post stand and the tilting post pier at either corner. The choice of the corner will be decided by the tilting range in which it is desired that the table operate.

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BLAST DATA:

Number of holes	11
Average depth	91′
Height of face	85′
Spacing	14′
Burden	27′
ROCKMASTER delays	1 to 6
Total explosives (Apex #2 LV and #4 HV)	11,400 lb.
Rock produced	34,170 Tons
Powder factor	3
Loading started	7:15 AM
Loading finished	10:15 AM
Blast fired	11:15 AM

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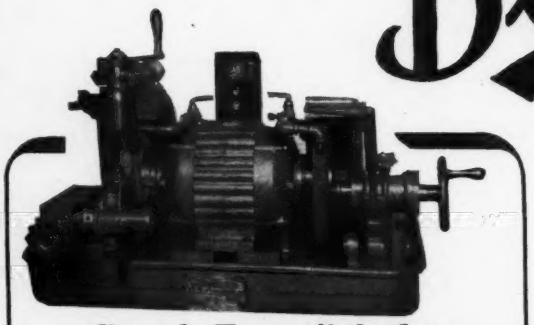

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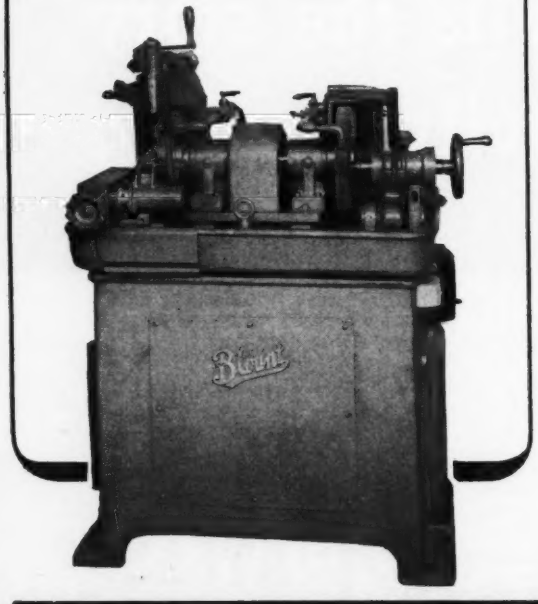

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Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

A LOOK at the legislative box score to date is not heartening to the Administration at this time. With three months gone since the President's "dynamic program" was laid before Congress little of it has reached any advanced stage of enactment.

The desire of both parties in Congress to return home by the end of July may result in deferring action on many of the legislative aims of the White House. With only four months remaining before this adjournment target date the record of accomplishment reads as follows:

The House has disposed of six appropriation bills but still has the major money measures to consider. The lower chamber has also approved the general tax code overhaul bill and a reduction in excise taxes. The Senate has stamped its approval on the St. Lawrence Seaway and passed three supplemental appropriations bills.

Major planks in the President's program which have received no action by either House as of this writing include Taft-Hartley revision, farm legislation, Reciprocal Trade extension and revampment, social security liberalization, and statehood for Alaska and Hawaii. The statehood bill is before the Senate but is the subject of lengthy debate due to the fact that statehood for both territories has been combined in a single bill which may imperil the chances of approval for either territory.

The fact that much of this program has not yet emerged from Committees makes it imperative that Congressional leaders speed up floor action if a substantial portion of the President's proposals are to be written into law. Failure to accelerate Congressional action may result either in the legislators being held in Washington far into the summer or in the sidetracking of some of the principal goals of the Administration.

Tax Revision Progresses

In its first major legislative battle the Administration last month emerged victorious by a slim margin. Marshalling its forces together with support from the minority party, the Republican party was able to fend off a determined drive by the Democrats to amend the general revenue revision bill to include higher personal exemptions for individuals.

The revision measure, after defeat of the higher exemption proposal, was approved by an overwhelming vote and sent to the Senate, where the prospects are not as good for overcoming a move, led by respected Senator George (Dem., Ga.), to hike the individuals' tax exemptions. The measure provides a host of changes in Federal tax laws including more liberal depreciation allowances, partial relief from double taxation of dividends, acceleration of corporate tax payments, regrouping of minerals and metals for purposes of percentage corporate tax rate for another year.

The House earlier approved an excise tax reduction bill, placing a ceiling of 10 percent on most excise taxes. A drive in the Senate Finance Committee to eliminate or reduce the tax on transportation of property was unsuccessful. Senate approval of the bill with some changes is anticipated and the differences will be ironed out in conference between the two Houses. It is likely that the President will approve the bill, even though he has registered opposition to some of the slashes in excises.

T-H Act Change Doubtful

Although both Senate and House Labor Committees are holding a steady series of executive sessions to draft revisions to the Taft-Hartley Act, to be placed before the respective Houses early in April, most observers believe that chances for any amendment of the Act at this session are slim.

The Senate Committee has limited its consideration to the Smith bill, embodying the President's recommendations, which is running up against sharp opposition from the six minority members who do not wish to report any bill unless it is palatable to labor union leaders. On the other hand the majority members, while favoring some bill, are not agreed on which of the President's recommendations should be included in the measure. Thus far the Committee has voted to narrow the concept of employer free speech rights, to ease the present secondary boycott ban, to make application for injunctions against secondary boycott discretionary with the NLRB, to require employers to wait 12 months and unions six months before seeking a representation election during an economic strike, to apply the common law rules of agency in fixing union responsibility for the illegal acts of union members, and to require employers to file non-Communist affidavits.

The House Labor Committee is writing a much stronger measure. When it emerges from the Committee, the bill is expected to contain an improved definition of secondary boycotts, a broad States' rights amendment, a stronger national emergency strike provision, and restrictions on the administration of the laws by the NLRB.

With these differences in view it is now considered unlikely that any Senate-House conference committee will be able to reach agreement on changes that can be approved at this session.

★ ★ ★ ★ ★ ★ ★

Washington Highlights

TAX REVISION: Before Senate.
T-H ACT: Changes doubtful.
TARIFF: Report delayed.
COAL: Governors consider problems.
STOCKPILING: Policies eased.
GAS STORAGE: Hearings under way.

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Tariff Report Delayed

The U. S. Tarriff Commission has been granted an extension of time, from March 31 to April 20, to submit its report to Congress on its general investigation of the lead and zinc mining industries. The report is to cover the effect of foreign imports of the two metals upon the domestic industry.

No indication is yet forthcoming from the Commission as to when its report will be made on the question of "escape clause" relief. The Commission has until June 13 to make such a report but the White House has urged that it be made sooner.

Meanwhile, the President's Cabinet Committee on Minerals Policy has held a series of meetings and is expected to announce its recommendations shortly—which it is thought may include a program for alleviating the critical situation existing in many of the mining industries today.

Coal Developments

On April 26 the Conference of Governors will begin a series of meetings in Washington with Government officials. Governor John S. Fine of Pennsylvania has selected that date to launch a new organization of Governors of coal-producing states for the purpose of recommending joint action on common problems relating to the coal industry. Fine has asked 15 other Governors to meet with him to discuss such matters as residual oil imports, federal tax policies, storage of natural gas in coal mining areas, water pollution, coal research, and reclamation of coal lands. Should this group decide to establish a permanent organization it is likely that it may be patterned after the Western Governors Mining Advisory Council.

Meanwhile the anthracite industry, which has suffered a serious economic setback, sent representatives to Washington late in March to confer with Interior Secretary McKay as to ways and means of aiding the industry and securing employment for the miners.

The industry representatives suggested that the Government use anthracite for heating Government buildings, public housing and barracks, and that a drainage program be undertaken in the anthracite area to eliminate mine water problems. Also discussed were freight rates, coal research, and Federal stockpiling of hard coal.

Press reports stated that McKay told the group the Government would step in with aid if a program was submitted by the operators that was "economically feasible." The industry was told that legislative relief was needed to effectively meet the distressed conditions in the industry.

Stockpiling Policies

The Office of Defense Mobilization has established a revised stockpiling policy to make certain that surplus metals and minerals, acquired under terms of the Defense Production Act, do not produce serious market effects. Materials thus acquired will be set aside for procurement for the national stockpile when materials on hand or on order do not fill stockpile goals. The goals may also be lifted to admit the materials to the stockpile. Materials not transferred to the stockpile will be disposed of at the going market prices and in such a manner as not to disrupt industry.

There is also being readied for announcement a plan under which all stockpile goals will be resurveyed, and the goals raised in the case of a number of strategic and critical minerals in order to relieve depressed conditions in some branches of the mining industry, notably lead and zinc.

A step toward aiding the industry was also taken by the Interior Department's Defense Minerals Exploration Administration, when it expanded the current exploration program to add 19 metals and minerals to the present list eligible for exploration loans. Added to the list were lead, zinc, bauxite, fluorspar, graphite, cadmium, antimony, corundum, diamonds, kyanite, mercury, monazite and other rare earths, quartz crystals, rutile, brookite, talc, thorium and tin.

Gas Storage

A Senate Interstate and Foreign Commerce subcommittee is currently holding a series of hearings on a measure that would extend the right of eminent domain to permit the underground storage of gas. Proponents of the measure have testified that the bill should be amended to protect active coal mining operations from hazards created by storage of gas in coal mining areas. Purpose of the bill is to provide storage space for natural gas during peak production times.

Bureau of Mines officials have also urged the Committee to amend the bill to provide for the safety of the mines.

Coal industry representatives, including the American Mining Congress have pointed out that the bill does not contain adequate safeguards against the use of the right of eminent domain, that such matters are best handled by the States, that the bill places no restrictions on gas storage in, under or around coal mining operations, that the safety of miners is not considered, and that the bill as drafted does not protect the property rights of coal and other mineral interests.

"That new blaster used to work at Oak Ridge!"

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cuts bit costs in half

...produces greater marketable tonnage

Here's what happened when Pennsylvania Coal and Coke Corp.'s 1800-ton per day Marsteller Mine installed sets of Kennametal Sintered Carbide Bits on its 9 continuous miners. Superintendent Pete Wilson reports that production is averaging 2990 tons per set . . . that the Kennametal cutting edges can be reconditioned 5 to 6 times. Power consumption is lower, and there is less penetration in bottom rock.

Bit cost per ton has dropped to $.0050 (less than half that of other bits). Fines in 3/4 to 2 1/2-inch screen coal are down 2 1/2 percent — proof of the important increase in this mine's quality commercial tonnage.

These operating efficiencies are possible because (1) tough Kennametal cutting edges have both greater shock and wear-resistance than any other tungsten carbide and (2) Kennametal's advanced tool design provides the proper bits for any cutting job. If you have a cutting or drilling problem, ask your Kennametal Representative to show you how the right Kennametal bit can solve it for you.

Kennametal Sintered Carbide Bits in one of Marsteller Mine's Joy miners. Style UMR4 Bits are used on rotor drum, U4R3 in side chains. Seam: "D", or Freeport.

Look for the name of your Kennametal Representative in the yellow section of your phone book, or on the back of your Kennametal Price Book — or, write direct.

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WHERE EXPLOSIVES RESEARCH PAYS OFF

About 487,000,000 tons of coal were mined last year to provide fuel for America's electric utilities, coke ovens for producing steel and cement, and railroads. Mining that tonnage economically and efficiently required nearly a quarter billion pounds of industrial explosives.

Illustrated is one example of how explosives research pays off. The proper use of the right type of permissible explosive brought down a high percentage of lump, ready to be used with a minimum of processing.

Such results come from Hercules' continuous explosives research and extensive knowledge of field conditions. These are important factors in the economical and efficient blasting of coal, metals and nonmetallics, quarrying, and construction. Our technical representatives welcome the opportunity to consult with you on blasting problems.

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AMC Personals

In early February the Senate unanimously and without debate approved the nomination of **Edward Steidle** as a member of the Federal Coal Mine Safety Board of Review. Steidle had been serving on the board under a temporary appointment. His term runs to July 15, 1955.

Frank A. Ayer, international copper mining consultant and **Walter H. Sammis**, president of Ohio Edison Co., have been named 1954 recipients of the Egleston Medal, Columbia University's highest award "for distinguished engineering achievement."

Frank A. Ayer

Ayer, recently with the Copper Range Co. and with Phelps-Dodge Corp., formerly was with the Roan Antelope Copper Mines, Ltd. and the Mufulira Copper Mines; Ltd. in South Africa. He is an internationally prominent mining engineer and consultant. He was graduated in 1911 from Columbia's School of Mines.

Sammis, a 1917 graduate of Columbia, is president of Ohio Edison Co., Pennsylvania Power Co. and is president of Edison Electric Institute for the 1953-54 term.

Several promotions, transfers and retirements have been announced by Red Jacket Coal Corp.

O. L. Craven has been promoted to assistant superintendent of the Coal Mountain No. 9 and 12 mines. **John F. Maurice** has retired after many years of services as chief engineer for Red Jacket. He has been succeeded by **C. H. Williams**, who was assistant chief engineer. **Norman W. Long**, resident engineer, succeeds Williams.

D. T. Posten, resident engineer for Wyoming County mines (W. Va.) of the firm has been transferred to serve as resident engineer for its Mingo County mines. **C. L. Glover** succeeds Posten.

G. F. Davis, formerly assistant superintendent of the Junior mine, succeeds **A. F. Cook** as superintendent of Red Jacket mines in Mingo County. Cook has retired.

Lewis Simpkins, general mine foreman, has been promoted to assistant superintendent of the Junior mine succeeding Davis and **A. A. Mankin** succeeds Simpkins.

C. H. Murphey has been appointed executive director of the New Mexico Mining Association, according to W. Page Morris, association president. In addition it was announced that the association headquarters have been moved from Carlsbad to Santa Fe, N. M.

On March 31, Murphey retired from the American Steel and Wire Division of U. S. Steel Corp. He is now devoting full time to his duties with the New Mexico Mining Assn.

Charles Elwin Walker has been appointed superintendent of Tioga No. 1 mine of Tioga Coal Corp. Before his recent promotion, Walker was general conveyor foreman.

Election of **Maurice F. Dufour** as assistant vice-president of Freeport Sulphur Co. by the board of directors was announced by President Langbourne M. Williams.

Dufour, who joined the company in 1933, has been manager of development since 1951. He is at present in charge of the company's project to develop nickel and cobalt at Moa Bay in Cuba.

During 1943 to 1947 Dufour was assistant general manager and then general manager of the nickel mining plant which Freeport designed, built and operated for the U. S. Government at Nicaro, Cuba.

H. C. Goodhart, vice-president of Westmoreland Coal Co., retired on January 31. He was succeeded by **B. M. Neel**, formerly assistant general superintendent of the Stonega Coke and Coal Co.

Norman H. Donald, Jr., assistant manager of the Edwards division of the St. Joseph Lead Co. has been transferred to the main office of the company in New York City. Donald will be doing exploration work in his new capacity with the company.

L. F. Workman, general manager of mines of the Lorado Coal Mining Co., announces the appointment of **Timothy L. Johnson** to the position of assistant superintendent of mines.

Louis A. Woodward, vice-president, Jack Ammann Photogrammetric Engineers, has been elected chairman of the Association of Professional Photogrammetrists, which represents nine companies, from the smallest qualified firm to the largest, making topographic and resource surveys from aerial photographs.

Previous chairmen since the Association was organized on February 23, 1951, were Virgil Kauffman, president of Aero Service Corp., and Ford Bartlett, president of Lockwood, Kessler & Bartlett.

Holly W. Spahr, vice-president of Pocahontas Fuel Co., Inc., has been elected secretary of the firm. Spahr succeeded **L. B. Crawford**, who retired at the end of the year after almost 51 years of service with the company.

Quenton Brewer, former chief of the Engineering Branch of the Exploration Division of the Grand Junction Operations Office, Division of Raw Materials, U. S. Atomic Energy Commission, has been named deputy director of the Exploration Division. **Daniel Hurley**, formerly assistant chief, succeeds Brewer as chief of the Engineering Branch.

John T. Parker, manager of Coal Properties, Inland Steel Co., has announced the following changes in personnel at the coal mining operations of the company.

Harry O. Zimmerman, chief engineer, has been appointed assistant to the manager of coal properties and **Joseph Peraino**, assistant chief engineer, has been promoted to chief engineer.

Zimmerman has been with Inland ever since it acquired the Kentucky property in 1930, and Peraino started with the company soon after his graduation from Lehigh University in 1936.

Blair T. Burwell has resigned as superintendent of the Inland Steel Co. Cayia mine to join the Minerals Engineering Co. at Grand Junction, Colo.

Joseph Fisher, Jr., has been named general superintendent of the No. 3 Mine, Sheridan - Wyoming Coal Co., Roundup, Mont.

Election of **A. S. Kromer** as a vice-president of Calumet & Hecla, Inc., was announced by Endicott R. Lovell, president. Kromer, who succeeds **Orson A. Rockwell**, will thus become general manager of the firm's Calumet Division with headquarters in Calumet, Mich.

John Lunski has been named superintendent of South Wilkes-Barre Colliery of the Glen Alden Coal Co. Lunski had been foreman of the No. 20 Tunnel from 1946 until the recent closing of that operation.

Lloyd W. Ingles, superintendent of the Colorado Fuel & Iron Corp.'s mine at Valdez, Colo., has succeeded **H. D. Pinkney** as superintendent of C. F. & I.'s new Allen mine.

Frank C. Bennett, superintendent at Morley, Colo., will succeed Ingles at Valdez, and **John W. Bodycomb**, now a C. F. & I. mining engineer in Pueblo, will become superintendent of the Morley mine.

J. Q. A. Price has been elected president of the Elkhorn Mining Co., near Boulder, Mont., and **Floyd L. Lewis** has been elected secretary-treasurer. Price and Lewis are succeeding **Wade V. Lewis** and **J. T. Lewis**, respectively.

E. W. Douglass has resigned as research director for the Potash Company of America effective April 1.

Douglass has had wide experience in the phosphate industry, as well as broad experience with other nonmetallics and chemicals in both North and South America. He is planning to do engineering consulting work in the chemical and metallurgical fields. His address will be 1113 Tracy Place, Carlsbad, N. M.

Walter J. Williams, deputy general manager of the Atomic Energy Commission since 1951, recently resigned that position to become vice-president of the Taconite Contracting Corp., a subsidiary of the Erie Mining Co. He will direct development of taconite in the Lake Superior area.

— *Obituaries* —

Shrive B. Collins, of Del Norde, Colo., passed away on January 5. He was a graduate of the Colorado School of Mines, class of 1901, and was a recognized authority on mining and hydraulics. He had been prominent in Colorado mining affairs for many years.

Francis H. Brownell, 86, chairman of the Board of the American Smelting and Refining Co. from 1930 until his retirement in 1947, died March 8 in New York.

Mr. Brownell, who was born in Rhode Island, began his career as a lawyer. From 1891 until 1916 he practiced law in Takoma, Everett and Seattle, Wash.

In 1916 he returned to New York and became general counsel of the American Smelting and Refining Co. In 1917 he was named a vice-president, and in 1919 became Chairman of the company's Finance Committee.

Mr. Brownell also served as President and Chairman of the Board of the Federal Mining and Smelting Co., Chairman of the Board of Directors of the General Cable Corp., and Chairman of the Executive Committee of Revere Copper and Brass, Inc.

He served as Director and a member of the Executive Committee of the Chase National Bank and Northern Pacific Railway Co., and was a director of the American Sugar Refining Co. He was a former President of the Copper Institute, and in 1932 presided over a world copper conference held in New York.

Conrad J. Neekamp, 72, past secretary of the Logan Coal Operators' Association and the Big Sandy Coal Operators' Association, died February 9. Mr. Neekamp was a principal figure in promoting the Big Sandy River navigation project.

Arthur Waldman, general superintendent of Frick Coal Division, United States Steel Corp., died unexpectedly March 10 while vacationing in Hollywood, Fla.

After being graduated from Lehigh University as a mining engineer, Waldman began his career as a laborer. He had wide experience in the coal and coke industry and at one time served as general superintendent of the coal mines of American Smelting & Refining Co. in Rosita, Mexico. He began his career with U. S. Steel in Birmingham, Ala., and in 1947 was appointed assistant general superintendent of the Frick Coal Division. In May 1951 he was named general superintendent.

On March 7 **Lee Llewellyn** died at Pittsburgh, Pa., after a brief illness. Born in Morgantown, W. Va., he received a BS Degree in Civil Engineering at West Virginia University in 1899. For 50 years he was engaged in the design and construction of coal preparation plants.

Mr. Llewellyn started with Heyl & Patterson, Inc., in 1901. He was chief engineer and later vice-president of the Pittsburgh Coal Washer Co. from 1911 until 1936, when he joined the Sales Department of the Koppers Rheolaveur and was with Roberts & Schaefer Co. in the Pittsburgh office when he retired from active service in 1951.

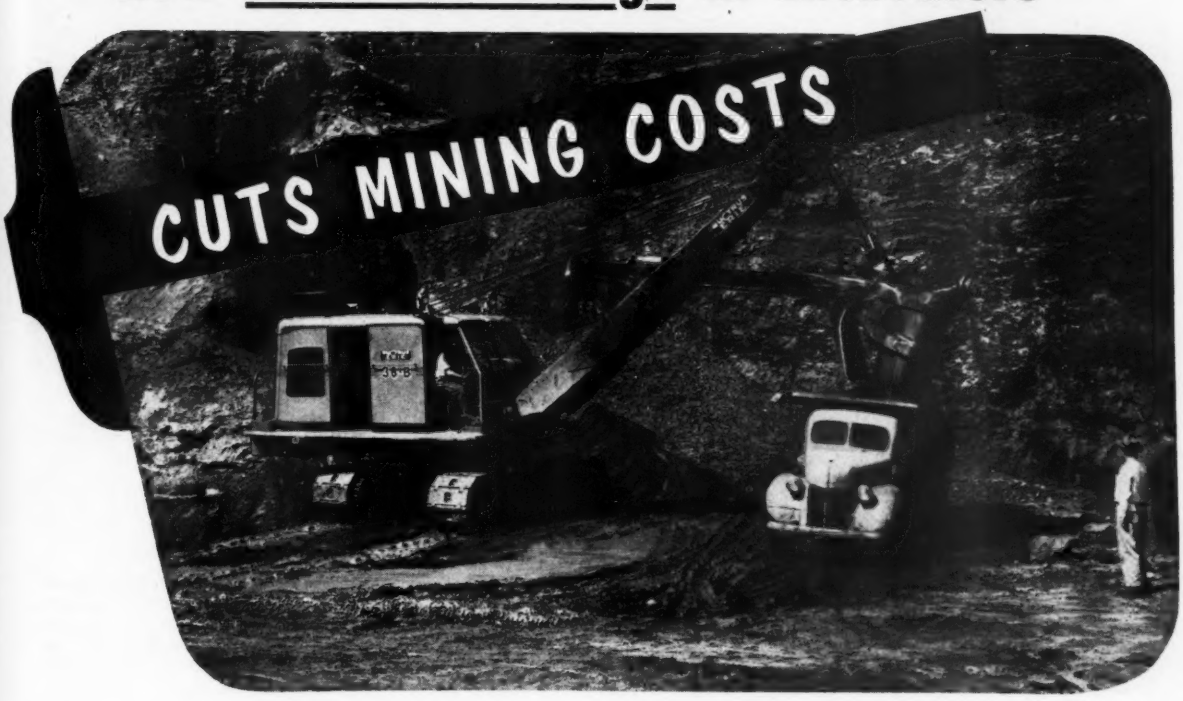
William J. Anderson, 45, a mining engineer for the Carbon Fuel Co., died February 11 in Carbon, W. Va., after a long illness.

Richard C. Berresford, manager of employe relations for The New Jersey Zinc Co., died suddenly at his home in New York City February 7.

Born in 1907, Mr. Berresford joined the Zinc Company in 1938 and began his work in employe relations in 1941. From 1941 to 1943 he was engaged in such work in both the mining and manufacturing departments of the company. In 1948 he became manager of employe relations, continuing in that capacity until his untimely death. He pioneered in the development of many activities of the Employe Relations Department. In addition he had been a member of the Pension Board since July, 1950.

Robert T. Daniel died on March 7, at his home in Birmingham, Ala. Mr. Daniel was president of the National Coal and Coke Co. and the Frankling Coal Mining Co. He was a leading Alabama industrialist and was prominent for many years in the coal business in the South.

How Individual Design In Excavators



A "line" of excavators **can** be built from a few basic models. Add some counterweight, speed up the engine, boost the dipper size — and one model becomes a larger size. It **can** be done . . . but ***you*** pay when it is. Here's what usually happens . . .

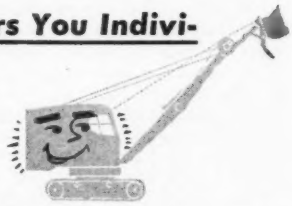
Some Excavators Will Be "Gold-Brickers" . . .

like this one. It will work fast and easy and no wonder! It's so over-powered it can fill its undersize dipper while loafing. But you are paying for power you can't use, twice over — in both higher initial cost and increased operating cost.

Some Others Are Weaklings

. . . such as this. The oversize dipper puts damaging stress and strain on every part. Every load it lifts speeds it on its way to the unhappy end ot a shorter life. You'll be replacing parts often, taking it out of service for maintenance — and wasting production time.

Bucyrus-Erie Offers You Individual Design . . .



each model is built individually from crawler treads to boom point. Every part is properly proportioned and coordinated for maximum efficiency at its rated capacity. No parts are interchangeable with other models. All are matched for top performance.

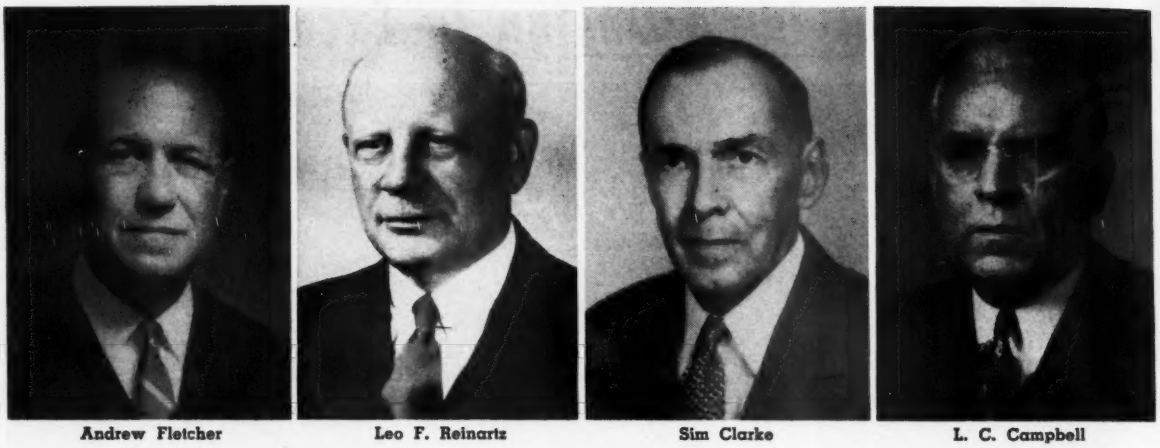
What Individual Design Means to You . . .

Individual Design means big loads, fast digging cycles, more output every shift . . . ***without*** excessive operating costs. Your Bucyrus-Erie distributor has the complete story. Let him explain further what Individual Design can mean to you specifically on your own mining jobs. 38E53

Bucyrus-Erie excavators are available from 3/8- to 4-cu. yd. gasoline, diesel, and single-motor electric shovels, draglines, cranes, clamshells, dragshovels (no 4-yd. dragshovel).

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN



Andrew Fletcher | Leo F. Reinartz | Sim Clarke | L. C. Campbell

Andrew Fletcher, President, St. Joseph Lead Co. and 1953 AIME President, turned the gavel over to Leo F. Reinartz, ARMCO Vice-President, and President of the AIME for 1954. Sim Clarke, General Superintendent of Tri-State Mines, Eagle Picher Co., was awarded the William Lawrence Saunders Medal. L. C. Campbell, Vice-President, Coal Division, E. G. & F. A., received the Erskine Ramsey Gold Medal.

AIME Meets in New York

Record Attendance at Annual Convention

From February 15 through 19, New York's Hotel Statler was the focal point for more members of the American Institute of Mining and Metallurgical Engineers than ever before. In the course of the four days of the Annual Meeting, mineral industry educators, economists, operating men and scientists presented learned papers on every phase of the mineral industry.

One of the special features of the convention was the Welcoming Luncheon on Monday. President Andrew Fletcher presided and introduced his successor, Leo Reinartz, who will guide the destinies of the Institute through the current year. Featured speaker of the day was Dr. Grayson Kirk, president of Columbia University, which is celebrating its 200th anniversary.

First Jackling Lecture

The Mining Branch meeting covered drilling, mining methods, exploration, mining problems, support of mine workings and industrial waters in a series of ten sessions. The Geology Subdivision of the Mining Branch put on nine sessions plus four joint sessions with other subdivisions of the Mining, Geology and Geophysics Division of the Institute.

The Daniel C. Jackling Lecture of the Mining, Geology and Geophysics Division was presented for the first time at this meeting. Reno H. Sales delivered the lecture at the Tuesday afternoon session. His topic was "Genetic Relations Between Granite Porphyries and Associated Copper Deposits."

At the luncheon meeting on Tuesday of the Mining, Geology and Geophysics Division, Andrew Fletcher, President of AIME, spoke on the subject "You and the Institute." Another feature of this luncheon was the presentation of the Jackling award to Reno H. Sales by Fred Searls, Jr.

The Institute of Metals Division held sessions on powder metallurgy, steel, titanium, physical chemistry and many other important topics.

On Tuesday morning, C. D. King of the United States Steel Corp. presented the 31st Howe Memorial Lecture. His topic was "Steel Making—Some Future Prospects."

Coal Division Meeting

The Coal Division's extensive program was marked by several joint sessions with the Canadian Institute of Mining and Metallurgy. These covered mining methods and preparation. One of the high spots of the Coal Division meeting was the annual luncheon on Tuesday, at which Chairman Ralph E. Kirk turned over the reins of Division Chairman to Maurice E. Cooper.

As a gesture of friendliness toward our Canadian neighbors, the Coal Division presented past President Desmond F. Kidd and President A. E. Flynn of the Canadian Institute with desk sets of Pennsylvania anthracite. President-elect Reinartz attended this luncheon and addressed a few words to the coal men present.

MBD Program

In a full program of 11 sessions, the Minerals Beneficiation Division discussed education, material handling, crushing and grinding, operating control, hydrometallurgy, concentration and held a joint session with the Industrial Minerals Division.

There was the customary horseplay and bagpipe music at the Scotch breakfast "as served by the honorary chefs." At the Minerals Beneficiation Division luncheon on Thursday, C. Harry Benedict, winner of the Robert H. Richards award "for his pioneering achievement in treatment of native copper ores . . ." was inducted with due "unceremony" into the Honorable Order of MBD. Donald W. Scott, retiring chairman of the Division, was also duly installed as a member.

Lighter Moments

On Monday night after a cocktail party, to which all members and guests of the Institute and their ladies were invited, the traditional stag dinner-smoker was held in the main ballroom of the Statler. The entertainment lived up to all expectations and everyone had a good time. The Informal Dance on Tuesday night was a success as were the Mining Branch dinner, where the principal speaker was Desmond O. Kidd, past President of the Canadian Institute of Mining and Metallurgy. From all reports the dinners and luncheons held by other divisions and branches as well as alumni groups and kindred societies were all well attended and enjoyed by those who were there.

At the Annual Banquet on Wednesday evening, presentation of the Robert H. Richards award was made to C. Harry Benedict and the James

Douglas medal was awarded to Dr. W. J. Kroll for "outstanding contributions to non-ferrous metallurgy, particularly in the art of lead refining and production of metallic titanium." The John F. Rand medal was awarded to Wilfred Sykes for his distinguished achievements in mining administration and service to his country and community. The William Lawrence Saunders gold medal was awarded to S. S. Clark, "for his distinguished abilities as a mining engineer; for his resourcefulness and his genius in adapting modern and in creating new mechanical aids in mining practice; and for his notable contributions to the productivity and longevity of the Tri-State district." The Anthony F. Lucas medal was awarded Dr. B. H. Sage for among other things, "his distinguished achievements in research on the phase behavior and thermodynamics of petroleum hydrocarbons."

The Erskine Ramsay Gold Medal was awarded to L. C. Campbell. The citation which accompanied this award read in part:

"As an engineer, operating official and executive, Mr. Campbell has served the coal mining industry with distinction. . . .

"He has made tremendous contributions to the conversion of coal mining from hand and animal industry to one in which machines and electric power win and transport the coal. . . ."

The Matthewson Gold Medal was awarded to Eugene S. Machlin and Morris Cohen. This medal is awarded for a paper or series of closely related papers considered the most notable contribution to metallurgical science during the period under review. The Robert W. Hunt Award is given to the author or authors of the best original paper on iron and steel contributed to the Institute during the period under review. This year the award went to J. F. Elliott, R. A. Buchanan and J. B. Wagstaff.

The J. E. Johnson, Jr., Award, which must go to a man under 40 years of age, was awarded to Robert O. MacFeeters. The citation accompanying the award of $75 to Mr. MacFeeters reads as follows:

"For the work reported in his paper 'Correlation Between Coke Plant and Blast Furnace Operations' and his other contributions to the knowledge of blast furnace operations."

Stanley F. Reiter won the Rossiter W. Raymond Memorial Award, which is given for the best paper published by the AIME during the period under consideration and written by a member of the Institute under 33 years of age at the time the paper was published. The paper which won Dr. Reiter the award in 1954 was "Recrystallization Kinetics of Low Carbon Steel."

Dr. Wm. E. Wrather was the recipient of the 50th John Fritz Medal awarded by the four Founder Societies for notable scientific or industrial achievement. Dr. Wrather's citation said that he was a geologist of world-wide experience and fame; an outstanding scientist and historian; and a wise leader distinguished for his service to the nation.

After the distribution of medals and honors and the introduction of members of the Legion of Honor of the Institute, Leo F. Reinartz took over for his term as president of the AIME.

In his first official speech he reviewed the present situation for the mining industry and the Institute.

After the president's reception, which followed the dinner, music and dancing were enjoyed by all.

Water Testing

(Continued from page 85)

is taking place in such a way that it is in contact with ground water. In one area the creek below a mineralized zone only reports "positive" in the spring and autumn and gives negative results after a long dry period in summer, presumably because then the zone of oxidation has lost contact with the water table.

Biogeochemistry An Adjunct

Normally if metal-bearing water is discovered and followed upstream, a place will be reached where the water no longer reports metal. In some cases iron staining, indicative of a mineralized zone, may be visible on the banks of the creek, but more often than not the bedrock may be hidden by a thick mantle of overburden.

If it is not possible to find outcropping mineralization in the critical area it may still be feasible to judge more closely the position of the mineralized ground by means of biogeochemistry. Biogeochemical surveys can be carried on during the winter season when travel through some types of country may be facilitated by snow and frozen ground. Thus by combining methods it is possible to explore an area entirely covered by glacial drift or badly covered by vegetation. This can be done by first using water testing for localizing the target, and then using plant analyses for closer exploration, followed in due course by the inevitable trenching and drilling.

In general the cost of systematically trenching or drilling along a grid set up on even a moderately drift covered area is great. In some areas at least, it appears that a good biogeochemical anomaly is a better bet on which to plan a drillhole than is a poor outcrop.

It must always be remembered that water testing is essentially just another tool for a prospector whether he be one of the "old timer" type or a mining engineer or geologist working for a company. A prospector is not supposed to find a mine, merely the reasonable prospect of a mine. A prospector should not be expected to apologize for not finding a mine. Water testing is a tool which gives a prospector one more chance of finding a mine. It is not a panacea for all the problems inherent in prospecting any more than any other tool.

Cooperation With Geophysics

In trying to show the part water testing may play in prospecting we may have given the impression that we have been promoting a self-contained outline for geochemical prospecting and the question might then well be asked, what do you propose to do with geophysics?

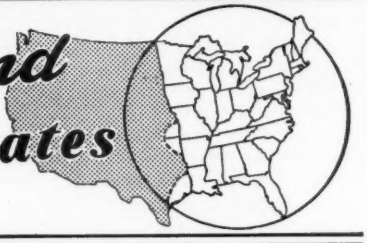
Two answers are possible. In the first place geochemical methods were primarily developed for use where for one reason or another geophysicists would not want to operate. In the second place geophysical and geochemical methods can frequently be combined for the achievement of the best and quickest results. For instance an aerial magnetic survey can detect many anomalies much more quickly and easily than can any team of footsloggers. Unfortunately many of these easily discovered anomalies are related to magnetite or pyrrhotite and may be of little or no value. However, the presence or absence of such elements as nickel, copper, or zinc within an acceptable distance of the anomaly may well be determinable by the use of one or more geochemical methods, of which water testing is one.

Similarly geochemical methods if used alone may only lead to a wide target area or to some small isolated mineral features outcropping in a creek bed. Here geophysics may aid to tell more about the depth of overburden or the general structure of the area. Geochemistry by itself may only succeed in discovering the most easily weathered mineralized zones and disclose little or nothing about the structure or even the relative richness of various zones.

To sum up, there is no opposition between geophysics and geochemistry, they are really complementary, geochemistry being more specific and geophysics more general. Only by using these two tools, always with geology, in close coordination, and with a cooperative rather than a competitive spirit, can we expect to discover, develop, and exploit those natural resources which have eluded us in the past because we have lacked suitable tools.

NEWS and VIEWS

Eastern and Central states



New J&L Air Shaft

Jones & Laughlin Steel Corp. has contracted with the Shaft & Tunnel Dept. of Dravo Corp. for the construction of a new concrete-lined ventilating shaft for J&L's Mine No. 5 near Marianna, Pa.

The shaft will be sunk vertically 574 ft through rock. It will be elliptical in shape and 41 ft, 9 in. long by 19 ft wide inside of concrete lining. A curtain wall installed the width of the shaft will separate the airway from the elevator compartment. Dravo also will erect a steel stairway in the shaft.

Truck Plant Water

The *P.C.C. News*, house organ of the Pittsburgh Coal Co., reports that on December 31 it was learned that the company which had been furnishing water to the Champion 1 Preparation Plant, could not continue to supply the water. Champion uses 450,000 gal. per day and if the plant was to be operated, something had to be done fast.

To solve the problem, six milk trucks were obtained and permission was received from the South Pittsburgh Water Co. to furnish much of the needed water. Deep well pumps were installed to furnish some more and a siphoning arrangement was put in at an abandoned dam nearby. Two large water tanks were used for storage, as was the abandoned Clark mine next to the cleaning plant. The trucks, operating 24 hours a day, hauled in approximately 270,000 gal. per day during the emergency.

Rain and snow during January and February have alleviated the situation. The fact that Champion lost no time stands as a monument to plant management and all those who had to do with "Operation H_2O."

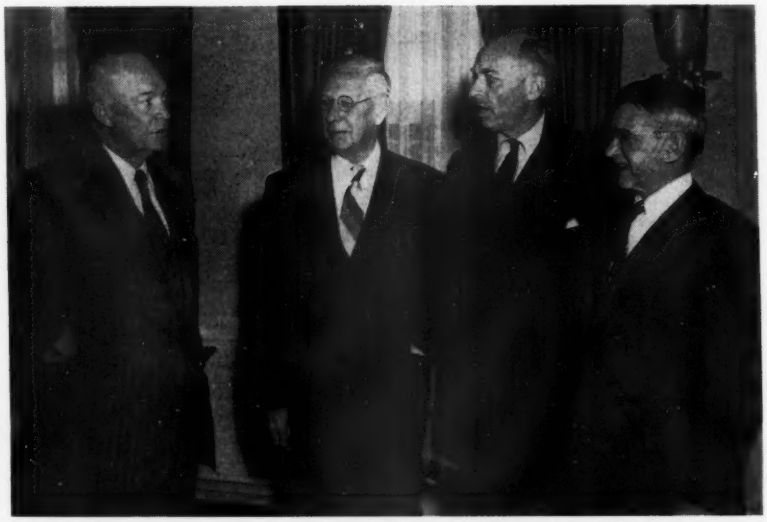
MHI to Meet in Chicago

Spring meeting of the Material Handling Institute will be held at the Drake Hotel in Chicago on April 13. The meeting will be called to order at 10:00 am by President C. B. Elledge.

Lead Industries Meeting

The Twenty-sixth Annual Meeting of the Lead Industries Association will be held at The Drake Hotel in Chicago on Thursday and Friday, April 22 and 23. Business sessions will occupy both morning and afternoon of the first day only. The affair will be concluded by the annual business meeting immediately following a luncheon on Friday, April 23.

President Greets Geological Survey Director



On the occasion of the 75th anniversary of the founding of the Geological Survey, President Eisenhower receives Dr. W. E. Wrather, distinguished director of the Survey. Shown here in the White House Executive Office are President Eisenhower, Dr. Wrather, Assistant Secretary of the Interior Felix E. Wormser and Secretary of the Interior Douglas McKay, who introduced Dr. Wrather to the President.

Resigns Two Directorships

James D. Francis, president of the Powellton Coal Co. and chairman of the board of its subsidiaries, the Princess Elkhorn Coal Co., and the Princess Coal Sales Co., has resigned as a member of the boards of directors and as a member of the executive committees of both the Island Creek Coal Co. and the Pond Creek Pocahontas Co.

These resignations bring to an end Mr. Francis' active service of more than 40 years with Island Creek and 30 years with Pond Creek. Over the years he has served as counsel, vice-president, president and chairman of the board of directors of both companies, which have long been recognized as leaders in the industry.

Mr. Francis gave as the reason for his resignations from the two companies a desire to devote more time to his own and his family's personal interests as well as to the many religious and public matters in which he has always taken an active part.

He is a member of numerous religious, industrial and educational organizations. He is a director of the National Council of Churches, Pikeville College and National Industrial Conference Board; an elder in the First Presbyterian Church of Huntington; a graduate member of the Business Advisory Council; a director of the National Coal Association and Appalachian Coals, Inc.

He is a member and former director of the American Mining Congress, National Association of Manufacturers, the United States Chamber of Commerce, Southern States Industrial Council, the International Chamber of Commerce and many other organizations. He is a member of the American Bar Assn. and of the bar associations of the states of Virginia, West Virginia and Kentucky and is also president of the Huntington Galleries.

At 70 years, Mr. Francis is in good health and looks forward to many interesting years in family, business and community life.

Atlas Scholarships

Atlas Powder Co. has set up eight $1000 college scholarships for science students, Ralph K. Gottshall, president, recently announced. The grants, he said, are part of the company's program to enable outstanding students to complete their scientific education in order to help meet some of industry's pressing needs for technical personnel.

The awards will go to students who will be seniors during the 1954-55 college year, majoring in chemistry, physics or any branch of engineering. The program, initially being proposed to 40 colleges and universities, will be administered by the Atlas committee on scholarships.

Scholarships will be awarded on the basis of scholastic records and the recommendations of the college staff. Extracurricular activities and financial need also will be factors.

Replace Burned Tipple

Limited production has been resumed at the Borderland Collieries Co. mine near Borderland, W. Va. The mine has been closed since fire destroyed the tipple and preparation plant two years ago. A new plant and tipple recently were completed.

The mine is a two-state operation. Coal is dug in Kentucky and crosses the Tug River on a conveyor to the tipple and preparation plant located in West Virginia.

Before the fire, the mine produced about 1000 tpd.

Million Bbl Cement Plant

According to a recent announcement, the Southern Cement Co. of Birmingham, Ala., is constructing a Portland cement plant at Roberta, Ala. The new facilities, which will have a capacity of 1,000,000 bbl annually are expected to be completed by the middle of 1954.

Clock Plant Performance

A set of four clocks is helping to keep tabs on preparation plant operation at the Tams No. 2 mine of Gulf Smokeless Coal Co. in Raleigh County, W. Va. The four clocks, which are synchronized each morning and evening, stop whenever certain operations are halted, giving the exact amount of time lost due to breakdowns or lack of coal.

One clock stops operation when the cleaning plant is stopped for trouble, breakdown or for any other reason such as a lunch period. When the plant starts operation again, the clock starts. Another clock gives the time lost due to no coal being delivered to the cleaning plant. A third clock goes off and stays off when the cleaning plant is halted at the end of the afternoon shift, giving an accurate check if any overtime is worked by the plant crew. The fourth clock is a master clock against which all other timing devices are checked.

Ohio Engineers to Meet

An Annual Conference for Engineers will be held at the Ohio State University of Columbus, Ohio, on May 7. The morning program of the one-day meeting will feature Charles F. Kettering, who will speak on "Getting Results from Engineering Research." Individual departments of the College of Engineering will present current research programs and will hold open house during the afternoon. As its program for the afternoon, the Department of Mining Engineering will feature a roundup of the American fuel situation.

Marquette Expands

Marquette Cement Manufacturing Co. has announced the outright purchase of the Superior Cement division of the New York Coal Co., and the Southern States Portland Cement Co. Purchase of the New York Coal Co. includes a plant at Superior, Ohio, and purchase of the Southern States Portland Cement Co. includes a plant at Rockmart, Ga. Acquisition of these properties will increase Marquette's production capacity by about 2,000,000 bbl and rank it among the five largest cement companies in the country.

Approve Expansion Plans

H. C. Meyer, chairman of the board of Foote Mineral Co., has revealed that directors of the company have tentatively approved further expansion of facilities for the production of lithium ores and chemicals. The proposed expansion will include major additions to the company's Kings Mountain, N. C., and Sunbright, Va., plants. Facilities at the Exton, Pa., plant will also be increased. Many of the present facilities were designed and built in the expectation of further expansion.

Close Red Ash Shaft

The Red Ash shaft of Woodward Colliery, Edwardsville, Pa., of the Glen Alden Coal Co. was closed permanently in mid-December. High cost of production was given as the reason for discontinuing Red Ash operations. The action idled an estimated 225 workers.

AS&R Enters Asbestos Field

At a recent press conference in Quebec City, Canada, a provincial cabinet minister, Hon. Tancrede L'Abbe, revealed plans for a multi-million dollar lake-drainage project financed by U. S. interests to initiate mining of a series of asbestos deposits which, he stated is "believed to be the largest in the world today."

"At least 50,000,000 tons of ore have been confirmed below the waters of Black Lake in Megantic County which will be drained to turn the hidden deposits into an open-pit project," Hon. Mr. L'Abbe said. "Plans for the lake drainage and the creation of an artificial lake about 1½ miles downstream as well as controlling dams have been filed and accepted by the authorities."

The Quebec cabinet minister stated that the U. S. interests concerned were American Smelting and Refining Co. Development of the Black Lake underwater deposits had been initiated and carried to this stage by United Asbestos Corporation Ltd. The American and Canadian corporations will operate jointly, it is stated.

The first mill to be erected on the property will have a capacity of 5000 tpd, Hon. L'Abbe said.

Canada has long been the world's leading producer of asbestos and supplier of practically all U. S. needs as well as 70 percent of the free world's requirements. Most of this output comes from a small section of Quebec, close to the Vermont border, the Black Lake-Megantic-Thetford Mines region. The world's largest asbestos mines and mills are located here. The United Asbestos property has been described by Canadian mining authorities as the only important new discovery in this established producing area in more than a quarter century. While the Black Lake deposits are as yet only partially explored, more than three miles of underground workings have been completed beneath the lake as well as very extensive programs of diamond drilling, much of this from the ice of the lake in winter.

Fire Destroys Commissary

The No. 1 commissary and general appliance building of the Inland Steel Corp. at Wheelwright, Ky., burned down in mid-January. E. R. Price general manager (now retired) of Inland's Wheelwright division, said that only the credit records had been saved.

New Cleaning Plants

Two Beckley, W. Va., area coal operators have recently awarded contracts for installation of new coal preparation facilities. Pardee Curtin Lumber Co. has contracted with Roberts & Schaefer Co. for coal cleaning equipment and accessory machinery to handle 65 tph of 4½ by ¾-in. coal at its Bergoo No. 4 mine.

A contract has also been closed by Royalty Smokeless Coal with Roberts & Schaefer for installation for a complete coal washery near Clifftop. Capacity at the new plant will be 340 tph.

Mining at Carlsbad

(Continued from page 74)

two skips. The other half is the upcast air shaft fitted with a fan at the top. When it is necessary to take large, heavy equipment into the mine, one hoisting rope is placed over a third sheave in the headframe centered over the air compartment. The entire upcast portion of the shaft is clear of obstruction and through this section of the shaft, the equipment is lowered. This procedure eliminates the expense of breaking equipment into pieces small enough to go through an ordinary skip compartment.

Conclusion

The increased demand for potash and potash chemicals is a constant challenge to the operators in the Carlsbad Basin. The search for new methods and improvements to existing facilities continues. Two of the companies are investigating the use of a Koepe type hoist. Industrial television is being considered in hoisting. Shaft sinking methods have changed. The newer properties are using round shafts. All of the operators in the Basin feel that the next few years will show further improvements in mining methods at Carlsbad.

The authors wish to acknowledge the cooperation and help of the staff personnel of all the potash producing companies at Carlsbad in the collection of data and information used in this paper. Thanks are also due to the various equipment manufacturers for their help and assistance in description of equipment used at Carlsbad.

Schedule Mineral Meeting

The Industrial Minerals Division of the AIME has scheduled a fall meeting at the White Face Inn at Lake Placid, N. Y., from October 5-9.

Reach Production Goal

Freeport Sulphur Co. reports that in mid-February its Garden Island Bay mine—the nation's newest source of sulphur—reached its announced production goal of 500,000 long tons of sulphur per year. The goal was reached less than three months after the mine was put into operation.

Mining operations at Garden Island Bay require more than 3,000,000 gal of water per day heated to a temperature of 325° F for melting underground sulphur.

Eagle-Picher Plant Progress

The large zinc roasting and acid plant of Eagle-Picher Co. at Galena, Kans., is rapidly nearing completion. Construction work, scheduled for completion in May, is about a month ahead of schedule, according to the project superintendent.

The new plant, which is to be the world's largest producer of sulphuric acid, will pipe the acid to the Missouri Farmers Association fertilizer plant being built a short distance northeast of the Eagle-Picher plant. Zinc calcine, the primary product of the roasting process, will be used by Eagle-Picher in other manufacturing activities. A nodulizing kiln also is being installed to be used in removing impurities that remain after the roasting process, thus improving the quality of the zinc calcine.

During the roasting process, the hot gases, which were once allowed to escape, will be used to heat plant boilers and then be sent through the processing equipment of the acid plant, where the sulphuric acid is derived.

The new plant will produce approximately 325 tons of sulphuric acid when full production is attained.

Coal Leaders' Output Up

According to figures recently released by the Keystone Coal Buyers Manual, the production of the leading 77 coal producers in the United States increased 4.7 percent in 1953 over 1952 production. This compared to a loss of 3.6 percent for the bituminous industry as a whole. Collectively, the 15 leaders of 1953 had a gain of 7.8 percent.

Pittsburgh Consolidation Coal Co. held its place as the nation's largest coal producer with an output of 27,209,616 tons. This was slightly more than six percent of the entire bituminous coal output in 1953. In 1952, Pitt Consol's share of the production was 5.4 percent.

Honor Safe Foremen

Two hundred fifty-four foremen of Eastern Gas and Fuel Associates were cited recently for records of supervising men from one to 14 years without any lost-time accidents. The men were listed on the "Honor Roll" issued by the Eastern Gas and Fuel Accident Prevention Department.

May Bolt Mine Floors

At the present time the use of roof bolts is undergoing thorough study in English coal mines. Their application to long wall mining is especially being studied and tests are being run to determine the value of using bolts to keep the mine floor from heaving in entries and roadways. One recent report reaches the following conclusion: "Without doubt roof bolting can give improved roof control and it seems that floor bolting may prevent or reduce floor lift."

That's Using Your Head

A vital piece of mining equipment has moved into the bookstacks of New York City's public library.

In times past employes of a library were equipped with flashlights to locate books on the unlighted shelves. However, they had a tough time manipulating flashlights when their arms were loaded down with books. The library has found a solution. It ordered 48 miner's head lamps.

Expand Alcoa Facilities

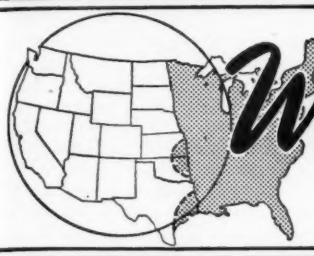
Expansion of facilities at the Mobile Alumina Works of Aluminum Co. of America has been completed.

Capacity of the plant, now the largest alumina plant in the United States, was increased by 33 percent during the expansion program that began in October, 1951.

New equipment added at Mobile involved all facilities for refining ore under the Bayer Process. Among the several new installations were a digester unit, new filter presses and precipitators, and a new calcining kiln.

A new storage building was erected to handle the greater supplies of ore that will be received from the Caribbean to fill the increased demand for raw material for the refining process. Conveyors were built to this building, other existing conveyors were enlarged, and bauxite handling facilities were expanded. The Alabama State Docks facilities for unloading bauxite were increased, in conjunction with Alcoa's expansion, to handle the greater incoming supplies of bauxite.

The new grinding facilities installed are a slight modification of earlier equipment. These facilities permit the handling of both dry and wet bauxites, whereas old equipment handles only dry bauxite.



Western States

Coke From Gilsonite

American Gilsonite Co. has successfully produced coke at its pilot plant at Bonanza, Utah, according to a recent report. The experiments are still in a most preliminary stage, however.

Objective of the pilot plant is to determine whether high quality coke usable as electrodes in aluminum manufacture can be produced successfully and whether that production can be attained economically.

World's Greatest Uranium Field

Dr. F. W. Christiansen, associate professor of geology, College of Mines and Mineral Industries, University of Utah, believes that if the present rate of development continues, Utah and Western Colorado might become the biggest uranium producers in the world. Dr. Christiansen made the statement before a monthly meeting of Utah Securities Dealers Association in mid-February. According to the university geologist, the "Big Indian district in San Juan County, Utah, already is one of the largest, if not the largest uranium ore area on the North American continent."

Christiansen went on to say that we are entering a new phase of uranium prospecting. From now on the search for uranium deposits will require a higher order of geologic investigation and correlation. "The obvious, surface indications of actual and potential commercial depositions have pretty well been picked over," he said.

Block Leasing Successful

After a year's experience with incentive block-leasing, Spokane-Idaho Mining Co. reports that the system has been highly satisfactory at the Constitution mine near Kellogg, Idaho. Since block-leasing was first introduced at the property in March, 1953, production per man-shift has increased 15 percent and millheads have been boosted about 67 percent, according to reports.

At the present time there are six leases in operation with about 23 men employed. In addition there are 23 men on the company payroll—in the mill and other surface work, on mine development for the company account, and in the company's adjoining Douglas mine development.

Under the Spokane-Idaho leasing contracts, leasers are actually independent operators who work as partners or employ their own labor. They are required to provide the explosives, fuse, drill steel and bits and must carry their own employers liability and insurance required under the Workmen's Compensation Act. They are free to mine by whatever method they prefer, providing it meets the safety standards of the Idaho mining code, and are free to undertake whatever exploration and development they wish within their blocks.

The company exercises no supervision over the mining operations and imposes no work requirements. It provides compressed air, power, water, timber, machine tools, tuggers, hose and fittings, pipe and tools, picks, shovels and such other equipment as is needed in the mining operation.

Duval Probes for New Ore

Duval Sulphur and Potash Co. has a large scale exploration program under way for copper and molybdenum. The company's surface diamond drilling is being done on the optioned claims of Coronado Mines, Inc., near Nogales, Ariz. Two holes were started last year.

Drilling centers around the Red Mountain mine where disseminated deposit has been found. Other deposits in the area are veins which also carry copper and molybdenum. Coronado's holdings total 10 mines and 163 inpatented claims.

Ore In Amador North Drift

The north drift on the new No. 4 level at the Revais Creek property of Amador Mining Co. near Dixon, Mont., has entered a highly mineralized zone, according to James F. Charlton, president. Pods of copper ores, primarily chrysacolla and chalcopyrite, have been encountered.

The company completed sinking 100 ft of shaft in December and cut a station on the new level. Drifting was started on the No. 4 level and the vein formation was reached in mid-January. Drifting then was started north and south along the contact zone. Amador has completed rehabilitation of the 60-ton mill on the property and installed a 200-hp diesel electric set to produce power.

"I understand, Dirrk, that you managed to pay cash for a new car on those 'Starvation Wages' I'm paying you"

New Power Plant for Oro Grande

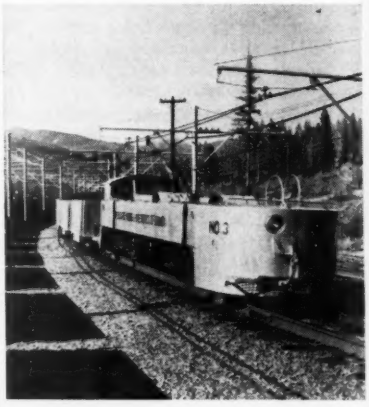
According to a report of the Riverside Cement Co. to its shareholders, the company is now receiving bids for the construction of a waste heat power plant at its Oro Grande, Calif., plant. In this power plant, the hot gases from kilns, presently being wasted, will be passed through boilers providing the principal source of steam for turbogenerators which will produce sufficient power to supply all the electrical needs of the Oro Grande plant, according to the report. It is estimated that plant construction will be completed in mid-1955.

To Ship Nevada Tungsten

Alpine Mining Co. expects to be producing tungsten concentrates from its holdings in Elko County, Nev., by mid-1954. According to the firm's annual report, tungsten exploration was undertaken after the firm discontinued development of lead-zinc deposits in another section of the property because of low prices for the metals. The lead-zinc development included cutting a shaft station at a depth of 100 ft and about 350 ft of crosscutting and drifting.

Unique Haulage Locomotive

The powerful 40-ton, 300 hp haulage locomotive shown here, first of its kind ever used in base metal mining, is one of three in operation at the Consolidated Mining and Smelting Co., Trail, B. C. Designed and built by the General Electric Co., these 250-v electrics have a draw-bar pull of 20,000 lb and are especially equipped for the unusually challenging braking job at this Canadian mine.



Ore must be taken from the mine downgrade to the smelter but for purposes of safety, the train must be kept within a maximum speed of 9.5 mph. To do this, not only was dynamic braking installed in these locomotives, but they were made heavy as well.

1954 Mining Show

Program Committee Appointed for San Francisco Meeting

WITH the appointment of the prominent State and District Chairmen listed below, the serious work of the National Program Committee for the AMC Convention in San Francisco, September 20-24, was off to a good start. Between now and early summer the full committee of representative mining men, in all branches of the industry, will give its best thought to matters that should be considered at the meeting and the selection of leading authorities in mining and government circles to take part in the program.

To help in determining which problems are uppermost in the minds of mining men across the country, suggestions from our readers will be welcomed. Address all communications to Program Committee % American Mining Congress, Ring Building, Washington 6, D. C.

Important as they are, the sessions dealing with the problems—operating, economic, and political—faced by American miners today are only a part of this great convention and exposition. Presidents of mining companies; superintendents of mines, mills and smelters; engineers, shift bosses, electricians, mechanics, machine operators, drill runners, even the man on the muck stick will return to the job full of new ideas and enthusiasm after a visit to San Francisco for the Mining Show this fall. Not only will each one learn about the accomplishments of other mining men, but through visits to the exhibit halls in the Civic Auditorium, he will have become familiar with all the newest machinery and the supplies that will help with the ore and mineral production of the future.

More than 135 machinery manufacturers and suppliers to the mining industry have taken space in the huge exhibit hall and the adjoining outside exhibit area. The displays they set up will show the very latest in mining, milling, metallurgical equipment and supplies. At each exhibit there will be trained representatives on hand, able to discuss the solution of any mineral industry problem from a wealth of experience gained through contacts with mining operations all over the world. Every conceivable kind of surface and underground mining machinery, together with ore treatment equipment of all types, will be on display. This 1954 exposition will feature all the modern aids to the production of metals and minerals.

Following the four days of the Show, visitors have a choice for Friday, September 24, of a Salmon Derby outside the Golden Gate, a trip to the gold dredging country in the Sacramento Valley, or an all-day session on milling problems of special interest conducted by the Minerals Beneficiation Division of the AIME.

Now is the time to make plans to attend this great convention and exposition. Each succeeding Mining Congress attracts more visitors and San Francisco has promised to do its utmost to take care of all who come. The city has many fine hotels and comfortable accommodations will be available for all. However, get your reservation in promptly if you have any particular preferences in hotels. Requests should be addressed to the San Francisco Convention and Visitors Bureau, Room 300, 61 Grove St., San Francisco 2, Calif.

Program Committee Chairmen

Alaska: ERNEST N. PATTY, Pres., Alluvial Gold Inc., and Pres., University of Alaska.

Arizona: ROBERT W. HUGHES, Gen. Mgr., Miami Copper Co.

California: GORDON I. GOULD, Gordon I. Gould & Co.

Colorado: MAX W. BOWEN, Exec. Vice-Pres., Golden Cycle Corp.

Idaho: CHARLES E. SCHWAB, Mng. Engr., Bunker Hill & Sullivan Mining & Concentrating Co.

Montana: F. E. BURNET, Supt., Montana Phosphate Products Co.

Nevada: A. E. MILLAR, Gen. Mgr., Yerington Mine, Anaconda Copper Mining Co.

New Mexico: HENRY H. BRUHN, Resident Mgr., United States Potash Co.

Oregon: FAY I. BRISTOL, Pres., Bristol Silica Co.

South Dakota: A. H. SHOEMAKER, Gen. Mgr., Homestake Mining Co.

Texas: CLAUDE O. STEPHENS, Vice-Pres., Texas Gulf Sulphur Co.

Utah: WALTER C. PAGE, Vice-Pres. & Gen. Mgr. of Western Operations, U. S. Smelting Refining & Mining Co.

Washington: KARL W. JASPER, Pres., Grandview Mines.

Wyoming: C. A. ROMANO, Resident Mgr., Intermountain Chemical Corp.

Mississippi Valley & Tri State: O. A. ROCKWELL, Vice-Pres. & Gen. Mgr. of Mines, Eagle-Picher Co.

Lake Superior District: R. T. ELSTAD, Pres., Oliver Iron Mining Division, U. S. Steel Corp.

Eastern States: D. S. MacBRIDE, Pres., Hercules Cement Corp.

Mining Equipment Manufacturers: RALPH K. GOTTSHALL, Pres., Atlas Powder Co.

Lucky Friday Progress

Work has been resumed on the big shaft raise of the Lucky Friday Silver Lead Mines Co. near Mullan, Idaho. Eventually this will be the main working shaft of the mine.

The first leg of the big three-compartment shaft-raise, from the 2000 level to a short distance above the 1800 level, was completed earlier. It will now be raised through to the main adit level, providing the mine with more adequate shaft facilities for the extensive mining and development program which the company plans. The present shaft has proven to be too small.

Hoisting equipment for the new shaft has already been acquired. A 400-hp double-drum hoist which was used at the 3850-level offset winze at the Morning mine will perform hoisting duty at Lucky Friday.

Display Nearly Ready

The mining frontier room of the Montana Historical Museum in Helena, Mont., should be ready by the beginning of this year's tourist season, according to K. Ross Toole, director. A diorama will show Virginia City, Mont., as it was in 1864.

AEC Releases Land

The U. S. Department of the Interior has advised the U. S. Atomic Energy Commission that it has issued a public land order revoking Public Land Order 760, dated October 22, 1951, which withdrew 38,194.94 acres of public lands and reserved minerals in certain patented lands in Utah for use of the Atomic Energy Commission in its search for uranium deposits. The revocation was requested by the Atomic Energy Commission because, where tested, no significant uranium deposits have been found on the lands.

The lands on which the withdrawal order has been revoked are in Garfield County, Utah.

New Phosphorus Furnace

Monsanto Chemical Co. is having a second elemental phosphorus furnace constructed at Soda Springs, Idaho. The unit is expected to be in operation by this fall.

The first furnace was placed in operation in Soda Springs by Monsanto on December 1, 1952. At that time the company announced plans for eventual construction of two electric furnaces. Successful operation of the first unit reportedly led up to a speed-up in the time-table for construction of the second furnace.

Abandon Plans for U-Ore Mill

The Vanadium Corp. of America has abandoned its plans to build a uranium processing mill at Hite in Garfield County, Utah. The decision was reached following a controversy with the Atomic Energy Commission over the metallurgy to be used in the mill. The disagreement ended in December when VCA began dismantling its experimental White Canyon mill.

The AEC is planning to establish an ore-buying and sampling station at Hite in lieu of the mill now being torn down in order to provide a local sale point for uranium ore producers in the area. The AEC hopes to get a mill constructed in this area, either by private capital or as a government-operated venture. About 90 percent of the uranium ore being produced at present and anticipated for the new mill would come from the Happy Jack mine, owned and operated by Joseph Cooper and Fletcher Bronson. Around 40 persons were employed in the experimental mill.

Tunnel Progressing

C. S. Woodward, president, Index-Daley Mines, Inc., reports that the firm's 4200-ft drainage tunnel in their properties, 29 miles from Mountain Home, Idaho, is in 2100 ft. Completion of the tunnel is scheduled for October, 1954, at the gold-silver properties.

Idaho-Maryland Developing

Idaho-Maryland Mines Corp. has started an extensive development program at its gold mines at Grass Valley, Calif., according to Max Bechhold, vice-president. With the emphasis on development, stoping operations have been curtailed.

Bolts Protect Hoover Dam

Rock bolts have been used to anchor a 20-ft slab of rock which could threaten the valve house of the towering Hoover Dam in Nevada.

The 180-ft by 115-ft slab is immediately above the valve house on the sheer canyon wall. Some thought was given to scaling off the rock, but it was decided that anchoring the rock by means of 350 two-in. wide steel bars, up to 33 ft long, would be cheaper. The bars are inserted into drill holes and then grouted.

Bureau of Reclamation authorities said the anchoring task was necessary because of earth tremors in the area. The tremors, it is believed, are caused by changes in the weight of Lake Mead formed by water impounded behind Hoover Dam.

Sunrise Iron Mine

The Sunrise mine, owned and operated by the Colorado Fuel & Iron Corp., at Sunrise, Wyo., is producing 2400 tpd of hematite ore and employs 300 men.

Originally the mine was an open pit operation and until 1942 was considered to be the deepest open pit operation in the world. The pit has since been abandoned and all operations are now underground. The iron deposit was originally discovered when early copper miners deepened their shafts and test pits and encountered the hematite. They abandoned their operations when the copper ore petered out.

In 1898 C. F. & I. learned of the Sunrise area and leased 72 claims. Three years later the firm purchased the claims and developed the present operation.

The main shaft, 750 ft deep, was completed in 1945. All ore is taken to the surface by this shaft and loaded directly into cars for shipment to Pueblo, Colo. Under existing conditions, it has been estimated that the Sunrise mine will be in operation for 25 or 30 years.

All this for You!

IN COAL MINE MODERNIZATION, 1954

Here's the year's greatest collection of useful information on methods, operating practices and equipment for efficient coal production and preparation. This handy book is actually the 1954 Coal Convention (Cincinnati, May 3-5) in print—all the papers and discussions, fully illustrated, arranged in an attractive, flexible binding for your convenient study and reference.

Coal Mine Modernization, 1954 is packed with hundreds of bits of information and ideas for the practical mining man.

Order your copy today—and order extra copies for other key men in your company. The price is only $3.00 per copy—and a special rate of $2.75 each applies on orders for 10 or more copies.

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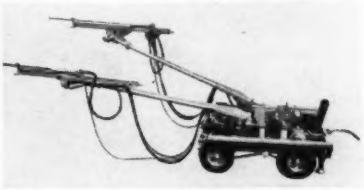
Manufacturers Forum

Make Drilling Easier

One operator can move into position with the new Gardner-Denver JSP Mobiljumbo and drill out a complete round in drift, tunnel, room, quarry or rock cut—without leaving his seat on the jumbo carriage—ac-



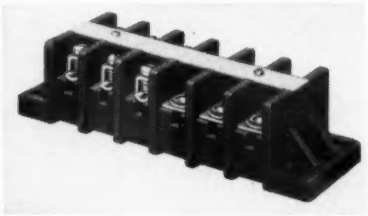
cording to the maker. Positioning of the booms and drills, as well as the complete drilling cycle, is handled by hydraulic controls conveniently grouped in front of the operator. The JSP Mobiljumbo, say Gardner-Denver engineers, has been designed to reduce still further the time, effort and cost required to drill rock in mines, quarries and rock excavation jobs.

Drills can be positioned for down holes or up holes, as well as for horizontal holes, making it possible to equip the JSP for drilling roof bolt holes.

Various boom lengths are available for efficient drilling of faces up to 14 ft high and 25 ft wide.

Terminal Blocks

A new high-current Terminal Block, which will be known as the Series "R" is being placed on the market by



Curtis Development & Manufacturing Co. This new Series will be available in three types, namely: Type "R," rated 35 amp, 750 v with No. 10 brass washerhead terminal screws for wire up to No. 10 AWG—Type "RH," rated 50 amp, 750 v with high-pressure solderless connector for wire from No. 8 to No. 19 AWG —and, Type "RHR," consisting of any combination of Types "R" and "RH" in the same block.

Complete information may be had by writing direct to John Eschweiler, Curtis Development & Mfg. Co., 3266 North 33rd St., Milwaukee 16, Wis.

New Chemical Pump Line

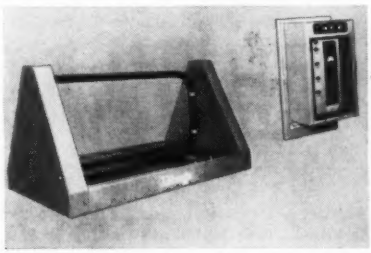
The Roy E. Roth Co. of Rock Island, Ill., announces a new line of end-mounted chemical pumps for acids, caustic solutions, solvents, and liquefied gases.

The line consists of 27 models suitable for heads up to 600 ft in a single stage and capacities to 100 gpm.

All models are equipped with high pressure flanged connections and are available in 316 stainless steel, 304 stainless steel, cast carbon steel, Hastelloy "C," Durimet 20, and nickel, as well as bronze and cast iron.

Protection Against Tramp Metal

Dings Electronics, Inc., (subsidiary of Dings Magnetic Separator Co.) Milwaukee, Wis., announces a new Electronic Metal Detector, built for mining



industry service, where extremely deep burdens are often encountered.

The new Dings Electronic Detector, embodying "ultra high sensitivity," is sensitive to all metals, ferrous or non-ferrous, and is said to detect even minute metal particles.

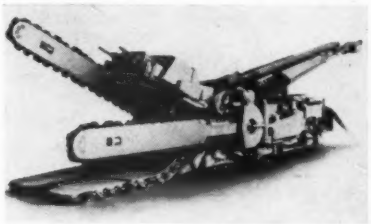
A wide range of signal and reject arrangements is available to provide automatic detection, with manual, semi-automatic, or fully-automatic rejection of tramp metal.

For detailed information address the manufacturer, 4740 W. Electric Ave., Milwaukee 46, Wis.

Jeffrey Acquires New Miner

The Jeffrey Manufacturing Co., Columbus, Ohio, announces that it has acquired all rights, title, and interest in and to letters patent from K. L. Konnerth, vice-president, Operations-Coal Division, United States Steel Corp., on a continuous mining machine which, heretofore, has been engineered and manufactured by Jeffrey. This machine, designated as 34-F, supplements Jeffrey's present line of continuous mining machines for coal.

The machine embodies the principles



of frontal attack utilizing a combination of digging and loading elements and vibrating hammers, the latter operating at a critical frequency to break down the coal. The entire machine is mounted on crawlers and the hammers are mounted on a carriage adjustable to various seam heights. The digging and loading portion of the unit, including hydraulic pumps for actuating all movements of the machine, is driven by one 70-hp continuously rated motor. A power truck which converts direct current mine power to alternating current of lower frequency than 60 cycles is provided to operate the hammers.

'Nother Use For Atom

Plans to use the products of atomic energy in research work at Caterpillar Tractor Co. have been announced by J. M. Davies, director of research.

Radioactive materials will be used to accelerate long-time endurance tests on parts, and are expected to give test results not obtainable by more conventional methods. Parts tested will be sent to Oak Ridge to be made radioactive.

"For example," Davies said, "we might use radioactive materials to test piston ring wear. By running a radio-

active ring in an engine we will build up radioactivity in the crankcase oil, thus giving a direct indication of the wear on the ring. We can complete the test with the aid of a Geiger counter."

Small Gasoline Pump

Portability and functional simplicity are two features of a new gasoline engine-powered pump designed for marine and mining water transfer by Hypro Engineering, Inc., Minneapolis, Minn.

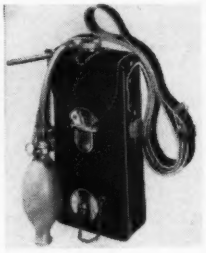
The hollow shaft pump, Model G 3800 VS, mounts directly on the drive shaft of a Model 5S one hp Briggs and Stratton gasoline engine and will run for 1¾ hr on a tank of fuel.

Capacity of the pump is up to eight gpm open discharge. Pressure range of the pump is up to 30 lb.

For additional information and prices write Dept. KP of the company at 404 No. Washington Ave., Minneapolis 1, Minn.

Riken Methane Indicator

National Mine Service Co. has been appointed exclusive distributor in this country for the U. S. Bureau of Mines approved Riken Methane Indicator. The instrument embodies the principles of optical projection in the determination of methane content in mine air. The direct-reading scale ranges from 0.0 percent to 6.0 percent.



An inexpensive, single-cell flashlight battery and bulb for illumination of the scale and a replaceable absorbent cartridge to remove moisture from the air sample are the only renewable items.

Write for full details to National Mine Service Co., P. O. Box 32, Beckley, W. Va.

New Nonmetallic Woven Tape

Lufkin Rule Co., Saginaw, Mich., uses the toughest miracle fibers developed by science in a new tape designed for long wear. According to the manufacturer, this new tape also has great dimensional stability.

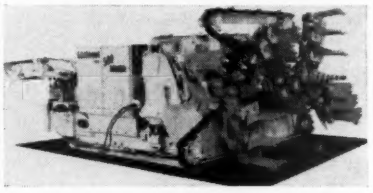
The nonmetallic Hi-Line is suited for general work especially around electric circuits because of its nonducting properties. It can take all the abrasion, moisture and general hard usage which mining work requires of a tape.

A four-color folder listing lengths marked, markings available and prices can be obtained by writing to the manufacturer.

Goodman Markets New Miner

Goodman Manufacturing Co. has announced a new continuous type mining machine.

Known as the Type 500 Miner, the machine has a fixed cutting height of seven ft and is capable, according to the manufacturers, of producing up to



seven tpm of coal from the solid, unprepared seam. It feeds into the seam by traction of its treads, cutting and breaking out coal with twin rotating units and a cutter chain.

For ease in withdrawing from a cut and for tramming, a six-in. clearance at top, bottom and sides is gained by retracting all cutting units. Seam irregularities can be followed by tilting the cutting units forward, backward or to either side. Tail section of the rear conveyor has a full 80° side swing and it is reported the machine can drive 90° crosscuts by maneuvering on independently controlled, reversible treads.

A 100-hp motor drives the cutting units, and a 50-hp motor powers the hydraulic system that controls all other machine movements. The machine cuts an oval path seven-ft high by 13 ft, two in. wide at its centers. The cut is arched at both sides and at the top but the bottom is squared off.

Improve Tractor Model

A heavier, more powerful D2—capable of pushing or pulling nearly 8000 lb—is announced by Caterpillar Tractor Co.

Drawbar horsepower in the new Cat D2 Tractor has been increased from 32 to 35 and belt horsepower is up to 42. Total weight of the machine has been increased approximately 525 pounds.

Overall length has been increased making it possible to remove the flywheel clutch without disturbing the engine. The seat has also been moved forward for better access to the rear of the steering clutch case.

Control Down-Hill Truck Speed

A new braking device which provides positive control over the downhill speed of off-highway trucks without wear on the conventional friction brakes has been announced by the Allison Division of General Motors Corp.

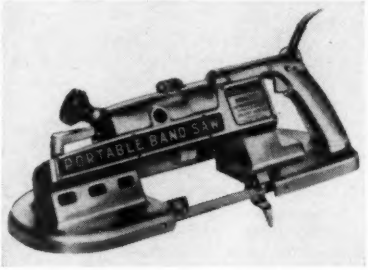
Known as the Torqmatic Brake, the new system consists of three major parts: a rotor, assembled as an integral part of the converter output shaft; the stator vanes, cast into the housing which encloses the rotor, and a control valve.

As the truck moves down-hill, the operator opens a control valve which admits oil to the brake. The paddles of the rotor churn the oil against the stator vanes, thus placing a drag on the converter-transmission drive shaft. If more braking is required, more oil is admitted to the brake. Source of the oil supply is the lubricating system for the converter and transmission, so after cooling the oil is returned to the oil reservoir for re-use.

The Torqmatic Brake has been undergoing a number of field service tests at various locations since August, 1952, and recently has been put into commercial production. It can be specified on new trucks or field installed on vehicles already equipped with Allison Torqmatic Drives.

Portable Metal Band Saw

A portable, electric metal-cutting band saw has been introduced by the Porter-Cable Machine Co., 33 Exchange St., Syracuse, N. Y. The new Model 524 Porta-Band Saw weighs 16 lb. The band speed is 240 surface fpm under load which is midway between the ideal speeds for ferrous and non-



ferrous materials. Design of the saw enables it to cut rectangular stock up to 3¼ in. by 4¼ in., or round stock up to 3¼ in. in diam. The motor is universal 115-v ac controlled by a trigger switch.

Pistol and Pump-Type Oilers

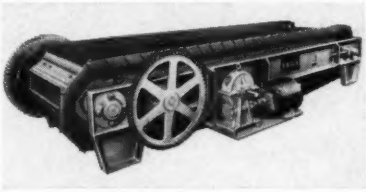
Several new changes and improvements have been made in the line of pistol and pump-type oilers manufactured by Plews Oiler Co.

A new seamless spout has been developed for all models to replace the soldered seam type previously used. A leak-proof coupling for use on all oilers with interchangeable spouts has been designed, and the method of attaching a fixed-type spout to the container has been improved. All models are made with one-piece drawn steel base.

Additional information may be obtained by contacting Plews Oiler Co., 701 South 7th Street, Minneapolis, Minn.

Show Apron Feeder

An Apron Feeder has been announced by Eagle Crusher Co., Inc., Galion, Ohio. It is intended primarily to handle stone, rock, coal and similar



heavy materials from hopper to crusher. Length of the unit is variable. Width is 6 ft 1 in. and height 2 ft 10 in.

The equipment is available with gear reduction drive with electric power or chain drive with clutch.

Portable SO_2 Detector

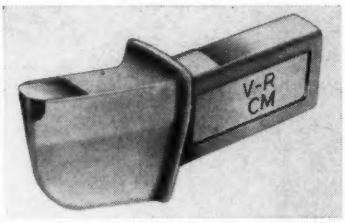
The new MSA "Sulphur Dioxide Gas Detector," now being announced by Mine Safety Appliances Co., is a portable instrument for quickly determining SO_2 concentrations of 0 to 50 ppm in the atmosphere of a working area.

The user squeezes the aspirator bulb three times for an adequate air sample, then reads the SO_2 concentration on a graduated scale on the detector tube. The reagent in the tester tube turns from blue to white, and the length of decolorization is directly proportional to the percent of SO_2 in the sample.

Details on the Sulphur Dioxide Gas Detector are available upon request, without obligation, from Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.

Improve Cutter Bit

A new CM chain cutter bit has been developed by the Vascoloy-Ramet Corp. The new bit has the shank modified to give a tapered recess for the holding set screw of the cutter chain. According to the manufacturer



this recess forms a pocket for the tightened set screw and eliminates the need for the set screw to "bite" into the shank in order to hold the cutter bit in place.

The shank of the CM bit is also heat treated and stress relieved to eliminate shank breakage. Further information on the new V-R CM bit with the tapered set screw recess may be obtained from Vascoloy-Ramet Corp., Waukegan, Ill.

— *Announcements* —

John P. Courtright, president and general manager of **Marion Power Shovel Co.,** has been sworn in as a consultant without compensation on mining equipment for the Agriculture, Construction and Mining Equipment Division of the U. S. Department of Commerce.

Courtright has long been active in power shovel industry activities and in 1953 served as chairman of the Manufacturers Division of the American Mining Congress. He presently is a member of the board of directors of the American Mining Congress.

The Long Super Mine Car Co., Oak Hill, W. Va., has changed its corporate name to **The Long Co.**

Ohio Brass Co. announces the retirement on May 1 of **Frederic Attwood** as vice-president in charge of Eastern Territory. Attwood joined the company in 1920 as general European agent, and in 1927 was elected to the post of vice-president and named a director of the company.

Although Attwood is withdrawing from active duties with the company, he will continue to serve as vice-president and director.

The mechanical goods division, **United States Rubber Co.,** has named **Henry E. Pruner** manager of conveyor and elevator belting sales.

Joy Manufacturing Co. announces the opening, on April 1, of a new district office at Cleveland, Ohio, for more convenient sales and service to the industrial, construction, quarry, and metal and non-metallic operations in the Ohio-Michigan area.

Howard E. Butters, formerly district manager in St. Louis, has been appointed district manager at the new Cleveland office with headquarters at 2410 Terminal Tower, Cleveland 13.

The appointment of **Joseph A. Bogan** as director of Public Relations of the Cleveland Rock Drill Division of **Le Roi Co.** has been announced. Bogan came to the Cleveland Division, Le Roi Co. from Bituminous Coal Research, Inc., where he was assistant to the vice-president and director of research.

The Reliance Electric and Engineering Co. has placed contracts for a new plant addition to its Ashtabula (Ohio) Division.

The new plant will be used to produce the company's new line of alternating current motors, built to recently-announced revisions in design standards of the National Electrical Manufacturers Association.

The appointment of **A. M. Lowrey** as assistant general sales manager, Western Division Branches, **Quaker Rubber Corp.,** Division of H. K. Porter Co., Inc., Philadelphia, has been announced.

At a recent meeting of the Board of Directors of **Hercules Motors Corp.,** **John C. Keplinger** was elected president.

CATALOGS AND BULLETINS

ALLIS-CHALMERS EQUIPMENT. *Allis-Chalmers Manufacturing Co., Tractor Division, Milwaukee 1, Wis.* A 36-page catalog describing A-C's line of crawler tractors, wheel tractors, motor graders, motor scrapers and wagons and their expanded line of pull-type scrapers.

ALUMINUM ROOFING AND SIDING. *Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.* This 16-page booklet describes methods of applying Alcoa corrugated Industrial Roofing and Siding. Also describes the maintenance-free characteristics of aluminum as a building material. Write for "Alcoa Aluminum Corrugated Industrial Roofing and Siding," 804 Alcoa Bldg. at the above address.

AMPLIDYNE SYSTEMS. *General Electric Co., Schenectady 5, N. Y.* Bulletin GEA-4053 describes amplidyne systems, how they operate, and where they can be used. The publication includes circuit diagrams, charts, and photographs.

HARDFACING ALLOYS. *American Manganese Steel Div., 389 E. 14th St., Chicago Heights, Ill.* This 48-page catalog contains Amsco's complete line of hardfacing and build-up rods and electrodes. There is also a complete technical section with charts and photographs to help select the correct hardfacing rod for those unusual or hard-to-solve wear problems.

LIGHT-WEIGHT PIPE. *Naylor Pipe Co., 1230 East 92nd St., Chicago 19, Ill.* Bulletin No. 507 shows typical applications of Naylor light-weight pipe and fittings. Included are standard specifications on pipe from 4 to 30 in. in diam, together with data on fabricated fittings, flanges, and connections to meet all pipe requirements.

MODERN MINING. *Thor Power Tool Co., Aurora, Ill.* A 20-minute film made underground at the Colorado School of Mines features action scenes of Thor sinker leg, stoper, air column air bar feed and power feed drifter machines. The color film is available for showings in Denver, Salt Lake City, Los Angeles, San Francisco, St. Paul, Birmingham, Philadelphia and Toronto, Canada. Bookings must be scheduled through local Thor branch offices.

SWECO SEPARATOR CATALOG. *Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles 58, Calif.* Describes a vibrating screen device used with suspended screen cloth for screening material down to 325 mesh. Those interested should write to Sweco Sepaartor Division at the above address and ask for Data File 106-231.

UNDERGROUND AIR OPERATED CORE DRILLS. *Sprague and Henwood, Inc., Scranton 2, Pa.* Bulletin No. 340 illustrates and describes two sizes of air-operated machines for either Diamond core-drilling or blast-hole drilling underground. Rod-pulling apparatus, with air-actuated piston is described for each machine.

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